



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

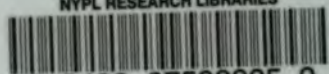
We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

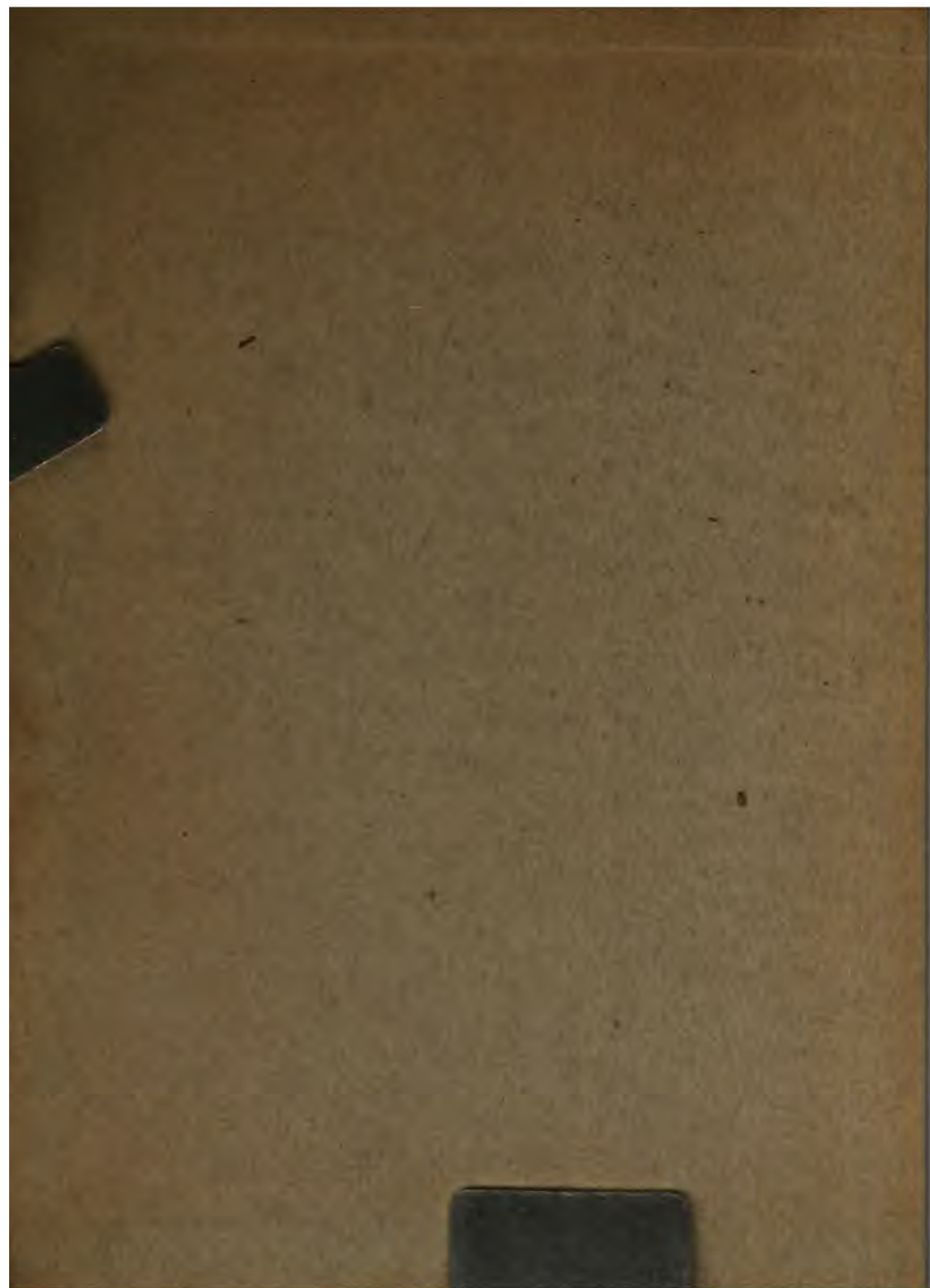
About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

NYPL RESEARCH LIBRARIES



3 3433 07598805 9



Drexel
254C

235477

 Drexel Institute
OF
Art, Science, and Industry
PHILADELPHIA

YEAR-BOOK
OF THE
Departments and Courses of Instruction



1903-04

S.S.M.C.

235477

 Drexel Institute
OF
Art, Science, and Industry
PHILADELPHIA

YEAR-BOOK
OF THE
Departments and Courses of Instruction



1903-04

SSMO



MAIN BUILDING.

Drexel Institute
OF
Art, Science, and Industry
PHILADELPHIA

YEAR-BOOK
OF THE
Departments and Courses of Instruction



1903-04

C. W. H.

285477

W. W. W. W.
W. W. W. W.
W. W. W. W.

PRESS OF
Bell Printing Company
2241-43 MARKET ST.
PHILADELPHIA.

CONTENTS

	PAGE
CALENDAR	vi
INTRODUCTION	I
BOARD OF TRUSTEES	13
ADVISORY BOARD OF WOMEN	14
OFFICERS OF INSTRUCTION AND ADMINISTRATION	15
DEPARTMENTS AND COURSES OF INSTRUCTION	21
DEPARTMENT OF FINE AND APPLIED ART	27
School of Illustration	28
School of Drawing, Painting, and Modeling	30
Clay Modeling	32
Wood-Carving	33
Course in Design and Decoration	39
Course in Architecture	45
DEPARTMENT OF SCIENCE AND TECHNOLOGY	53
School of Electrical and Mechanical Engineering	53
School of Mechanic Arts	80
Course in Mechanical Drawing	90
Course in Machine Construction	95
Special Courses in Science	101
Mathematics	101
Physics	106
Chemistry	112
DEPARTMENT OF COMMERCE AND FINANCE	120
School of Commerce and Accounts	122
Commercial Course for Teachers	128
Office Courses: Secretary—Bookkeeping—Stenography	131
DEPARTMENT OF DOMESTIC SCIENCE	139
Courses in Cookery and Household Economics	140
Normal Course in Domestic Science	144

	PAGE
DEPARTMENT OF DOMESTIC ARTS	153
Courses in Dressmaking	153
Courses in Millinery	160
Normal Course in Domestic Arts	165
JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS	173
Advanced Elective Courses	177
LIBRARY SCHOOL	183
COURSES IN ENGLISH LANGUAGE AND LITERATURE	190
DEPARTMENT OF PHYSICAL TRAINING	194
DEPARTMENT OF EVENING COURSES	199
ART COURSES	202
Free-hand Drawing	202
Drawing from the Antique	202
Wood-Carving	202
Clay Modeling	202
Life Class	202
ARCHITECTURAL COURSES	202
Preparatory Class	203
Architectural Drawing	203
Architectural Design	204
House Construction Drawing	204
Building Construction	205
Pen and Ink Rendering	207
Water-Color Rendering	207
SCIENCE COURSES	209
Mathematics	209
Physics	210
Chemistry	211
Electrical and Mechanical Engineering	213
Mechanical Drawing	226
Shopwork	227
COMMERCIAL COURSES	228
Bookkeeping—Commercial Arithmetic—Penmanship	228
Stenography and Typewriting	229

CONTENTS

v

	PAGE
DOMESTIC ARTS AND DOMESTIC SCIENCE	231
Dressmaking	231
Sewing	233
Millinery	233
Cookery	234
ENGLISH LANGUAGE AND LITERATURE	236
PHYSICAL TRAINING	237
CHORAL MUSIC	238
DEPARTMENT OF FREE PUBLIC LECTURES AND CONCERTS	240
LIBRARY AND READING-ROOM	243
MUSEUM	248
PICTURE GALLERY	253
INDEX	255

CALENDAR

1903-04

FIRST TERM begins Thursday, September 17th.

SECOND TERM begins Monday, February 1st.

EVENING COURSES begin Thursday, October 1st. **Session**
closes Thursday, March 31st.

COMMENCEMENT, Thursday, June 9th.

EXAMINATIONS FOR ADMISSION, Thursday and Friday, September 17th and 18th, 1903, and Friday and Saturday, June 10th and 11th, 1904.

EXHIBITION OF WORK of the various Departments, Wednesday and Thursday, June 8th and 9th.

CLOSING EXERCISES AND EXHIBITION OF WORK of the Department of Evening Courses, Thursday evening, March 31st.

HOLIDAYS

THANKSGIVING DAY until the following Monday.

CHRISTMAS HOLIDAYS, Thursday, December 24th, to Friday, January 1st, inclusive.

WASHINGTON'S BIRTHDAY, Monday, February 22nd.

EASTER HOLIDAYS, Friday, April 1st, to Monday, April 4th, inclusive.

MEMORIAL DAY, Monday, May 30th.

DREXEL INSTITUTE OF ART, SCIENCE, AND INDUSTRY

INTRODUCTION

The Drexel Institute was founded in 1891, by Anthony J. Drexel, for the promotion of education in art, science, and industry. The chief object of the Institute is the extension and improvement of industrial education as a means of opening better and wider avenues of employment to young men and women. At the same time the academic departments provide for the general development and liberal training of the mind and character of the students, and in the more special and technical courses the same end is kept in view, so far as the necessary limitations of the instruction permit. In accordance with the founder's intention, the plan of organization has been made so comprehensive as to provide liberal means of culture for the masses, by means of evening classes in all the departments of the Institute; by free public lectures and concerts during the winter months; and through the Library, Museum, and Picture Gallery, which are open free to the public throughout the year.

The Main building was dedicated with appropriate ceremonies, December 17th, 1891. A beginning was made

in some of the departments in February, 1892, and in September of the same year instruction was regularly begun in most of the departments included in the general scheme of organization.

The Institute is situated on Chestnut Street, at the corner of Thirty-second street. This location was chosen as being the most central and the most convenient of access from all parts of the city. It is at a point near where a number of the principal highways converge, within easy reach of three or four main lines of street railways; but one square from the new Pennsylvania station at Thirty-second street; and three squares from the Baltimore and Ohio station.

The founder's gifts to the institution, as a whole, amount to three million dollars. Of this sum, one million was expended upon the original building with its equipments and appliances, and two millions set apart for the permanent endowment. To these should be added the cost of the new building, East Hall, and the investments in the Library, Museum, and Picture Gallery, which amount to over one million dollars, making the total amount of the endowment and the value of the property belonging to the Institute, four million dollars. The endowment fund of two million dollars is applied in maintaining the instruction. This enables the Institute to offer the instruction at extremely moderate and, in some of the evening classes, at almost nominal rates. A number of free scholarships are open to deserving students.

The Institute is open to both sexes on equal terms. Students are recommended to enter regularly one of the departments or courses, but the same liberal opportunities are provided for those taking special or elective courses as in the regular courses.

The Evening Classes, which are open for six months of the year, from October to March, inclusive, offer instruction and training of the same kind and character, and with all the advantages of the extensive appliances and apparatus, as the instruction and training given in the day classes and at much lower rates. Systematic courses in all the departments of the Institute are organized for the benefit of the evening students, and certificates are granted to those who finish these courses and pass the required examinations.

Besides the instruction provided in the several educational departments, the Institute carries on a large and important educational work through the means of the Free Public Lectures and Concerts which are given during the winter months. These lectures aim to furnish opportunities for general culture to the public at large, a work in which the Library, Museum, and Picture Gallery are made to cooperate. During the past few years, the attendance at the lectures and concerts has averaged thirty-five thousand.

In the administration of the Institute, every effort is made to bring the opportunities for improvement, which are so liberally provided, within the reach of the largest possible number.

BUILDINGS

The Institute buildings comprise the Main Building, the first erected, in 1891; East Hall, completed in 1902; and the Annex, a block of houses which have been gradually adapted to the uses of the Institute since 1893.

MAIN BUILDING

The Main Building is a large and imposing structure in the style of the classic Renaissance, or what would be

better described as a modern interpretation of Greek forms. This gives assurance of its purity of spirit and explains the impression it makes as a harmonious whole. Even the colors of the marble used are in harmony with the scheme of decoration, which consists chiefly of buffs and reds. The Greek motives are met with in almost everything about the building, even to the bronze electric light fixtures which were specially designed for the Institute. Additional beauty is lent to the exterior by the ornamental terra-cotta work. The façade on Chestnut street is broken in the middle by an attic story which projects above the roof of the structure proper. This is the centre of the ornamentation, for here the wide frieze which extends around the building, between the second and third stories, meets above the lofty archway. The portal, which is the main entrance, is twenty-six feet wide at the base and rises to a height of thirty-five feet. The decoration of the arch is elaborate and is made doubly interesting by the addition of a series of finely executed high-relief medallion portraits: Bach, representing music; Raphael, painting; Goethe, poetry; Columbus, navigation; Newton, mathematics; Faraday, physics; Humboldt, natural history; Jefferson, government; Galileo, astronomy; Shakespeare, drama; Michael Angelo, sculpture; William of Sens, architecture. In the spandrels of the arch are medallions of Apollo and Moses.

The central object of the arch is a figure representing the Genius of Knowledge. Above her, in the frieze, is a tablet bearing the words, "Drexel Institute." Another finely designed frieze extends across the attic.

The Main Building contains, with the exception of the Lecture-room and the Picture Gallery, all the large and important features of the Institute devoted to public uses—

the Great Court, the Library, the Museum, the Auditorium, the Gymnasium, and several of the departments.

The Entrance-hall, the Great Court, the Library, the Museum, and the Auditorium occupy the first floor. The Gymnasium is in the fourth story. The administration offices are on the first floor, opening from the Entrance-hall.

In the second and third stories are located the following departments, each with a group of rooms adapted to its own purposes : Science (Chemical and Physical laboratories and lecture-rooms), Mechanic Arts, Commerce and Finance, Mechanical Drawing, Decoration and Design, Library School, Domestic Science, Junior Domestic Science and Arts.

The technical shops connected with the courses in Engineering, Mechanic Arts, and Machine Construction are in the basement, in which are placed also two of the large Electrical Laboratories.

EAST HALL

To meet the growing requirements of the Institute, this building, located on Chestnut street directly east of the Main Building, was erected in 1902. It is four stories high, two hundred feet long and sixty-five feet wide, extending from Chestnut street to Ludlow street. The ground on which it stands was a gift from Mr. James W. Paul, Jr., President of the Board of Trustees. East Hall is connected by the Lobby and enclosed galleries with the Main Building, thus retaining the Great Court, the Auditorium, the Library, and the Museum as the central features of the Institute.

With the exception of the space devoted to the Public Lecture-room and the Picture Gallery, East Hall is

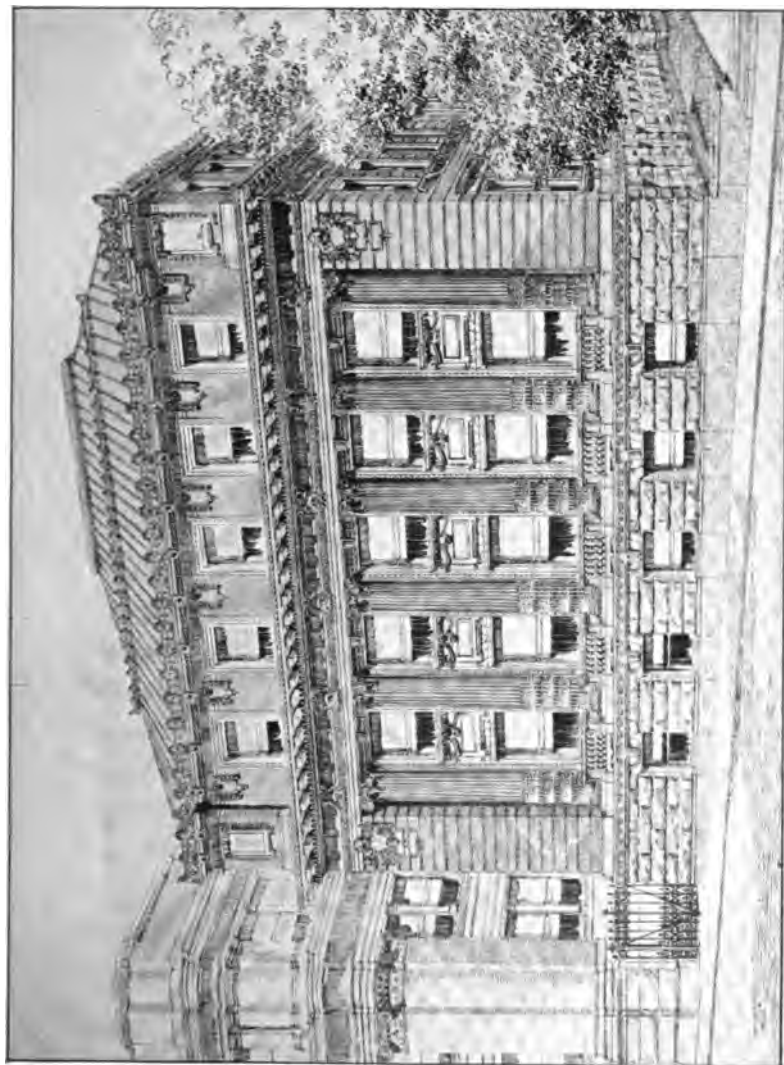
occupied wholly by class-rooms, Department lecture-rooms, laboratories, and studios. The basement story is given up to the Electrical and the Mechanical Laboratories, the Forge-room, and the Foundry. On the first floor there is a range of class-rooms with the Public Lecture-hall in the rear. The second floor contains the Department of Architecture and the Department of Domestic Arts. The third floor is occupied by studios of the Schools in Drawing, Painting, and Illustration, and by the Picture Gallery in the front pavilion.

ANNEX

The Annex is situated on Thirty-second street, immediately west of the Main Building. In it are located the Biological Laboratory, the Model Laundry, a number of rooms devoted to the work of the Domestic Science Department, and the Students' Restaurant, the latter occupying the first floor.

THE GREAT COURT

Beyond the Entrance-hall in the Main Building is the Great Central Court, sixty-five feet square, the entire height of the building, and covered with a decorated ceiling, the centre of which is filled with stained glass. At the farther end of the court is the double marble stairway, ascending to the upper stories and descending to the Auditorium and to the workshops and laboratories in the basement. The stairway is flanked by a pair of magnificent bronze and gilt candelabra, supported by marble pedestals and fitted with electric lamps. Arcades support and enclose the broad galleries which run around the court on the second and third floors. From these galleries open the class-rooms,



EAST HALL.

1911

laboratories, and studios, all of which are lighted from the exterior of the building. There is thus a free circulation of light and air throughout the entire building. The Portico, Entrance-hall, and Central Court are wainscoted in marble; the arcades are faced with enameled bricks, and the dividing cornices are of terra-cotta; the woodwork throughout the building is of polished oak.

THE AUDITORIUM

The Auditorium, located in the Main Building, is reached from the Great Court by the marble stairway, besides which there is an entrance on Thirty-second street. This hall is capable of seating fifteen hundred persons. On the stage is the grand organ, which, with the screen, is decorated in the style of the Italian Renaissance. Doorways lead from the stage, on both sides, to the retiring-rooms. Over one is the name of Bach, and above it is a scroll inscribed with a chord from one of his scores; a similar specimen of Händel's music ornaments the other doorway. On the south wall of the room, in the recessed arches, are inscribed the names of the great leaders of thought and culture: Aristotle, Dante, Michael Angelo, Shakespeare, Beethoven, Washington, Gutenberg, Galileo, Franklin, Watt, and Darwin.

THE LECTURE-ROOM

The Lecture-room, situated on the first floor of East Hall, is reached through the Lobby opening from the Great Court. It is a well-proportioned room, sixty-five feet long and forty-three feet wide, and is lighted on three sides by transom windows. It seats with comfort four hundred per-

sons, and is used for lectures to students and for the smaller audiences attending the Public Lectures.

THE LOBBY

The Lobby is a spacious passage-way connecting the Main Building and East Hall. It is practically an extension of the Museum, containing the valuable collection of Hand-Printed Indian Cloths ; the important representative collection of European Textiles belonging to the period from the fourteenth to the eighteenth centuries ; the view of the Façade of the Church of San Marco, constructed from the series of chromo-lithographic plates belonging to the great work on that building published by Ognani at Venice, and forming a picture eight feet long by six feet high ; besides other objects of interest.

LIBRARY AND READING-ROOM

On the first floor of the Main Building, opening from the Entrance-hall, are the Library and Reading-room, and the Museum.

The Library and Reading-room is a fine apartment one hundred and twenty feet long by sixty feet wide. It contains thirty thousand volumes, and is supplied with the leading American and European periodicals relating to art, science, and technology.

PICTURE GALLERY

The Picture Gallery is located in East Hall. The gallery is a large, well-lighted room, and is open to the public as well as to the students of the Institute. It contains the valuable collection of paintings bequeathed



VIEW IN THE GREAT COURT.

in 1901 by the late John D. Lankenau. This collection is especially interesting because of the examples of the modern German masters. Among the painters represented are : Andreas Achenbach, Oswald Achenbach, Brandt, Dücker, Gebler, Grützner, Heilbuth, Knaus, Koekkoek, Lauenstein, Lessing, Preyer, Salentin, Schreyer, Corot, Daubigny, Diaz, Dupré, Jimenez, and Ziem. There are also interesting copies of paintings by Raphael, Carlo Dolci, and Andrea del Sarto.

Besides the Lankenau Collection, the Institute possesses a number of fine paintings bequeathed by its founder. Among these are examples of the work of Meissonier, Bouguereau, Jules Stewart, Coignard, Dupray, Cesar de Cock, Boldini, Rico, Michétti, Madrazo, Jimenez, Ecüsquisa, Van Marcke, Gierynski, Ridgway Knight, Richards, Hamilton, and others.

MUSEUM

The collections of the Museum embrace specimens in every department of industrial art. The decorative arts of Egypt, India, China, Japan, and Europe are well represented. The Egyptian collection is fully representative, and embraces sarcophagi, wood-carving, bronzes, glass, textiles, and coins.

GYMNASIUM

The Gymnasium, in the fourth story of the Main Building, is a large, airy, and well-lighted apartment, and is entered by hallways on the third floor. Connected with the entrances to the Gymnasium are the bath-rooms, fitted with marble compartments and supplied with hot and cold water. Lockers, coat-rooms, and lavatories are placed in all four stories of the building.

HEATING, LIGHTING, AND VENTILATION

In the basement of the Main Building are the extensive steam, mechanical, and electric plants, which supply all the buildings of the Institute.

Great attention has been paid to the heating and ventilation of the buildings. They are lighted throughout with electricity. The Main Building is fitted with the Johnson self-regulating heating apparatus, which secures an equable temperature at all times throughout the court, corridors, lecture-rooms, class-rooms, studios, laboratories, and technical shops.

DEPARTMENTS

I. DEPARTMENT OF FINE AND APPLIED ART.

School of Drawing, Painting, and Modeling.

School of Illustration.

School of Design and Decoration.

School of Architecture.

II. DEPARTMENT OF SCIENCE AND TECHNOLOGY.

School of Electrical and Mechanical Engineering.

School of Mechanic Arts.

Course in Mechanical Drawing.

Course in Machine Construction.

Special Courses in Science: Mathematics, Physics, Chemistry.

III. DEPARTMENT OF COMMERCE AND FINANCE.

School of Commerce and Accounts.

Commercial Course for Teachers.

Office Courses : Secretary, Bookkeeping, Stenography.

IV. DEPARTMENT OF DOMESTIC SCIENCE.

Courses in Cookery and Household Economics.

Normal Course in Domestic Science.

V. DEPARTMENT OF DOMESTIC ARTS.

Courses in Dressmaking.

Courses in Millinery.

Normal Course in Domestic Arts.

VI. DEPARTMENT OF JUNIOR DOMESTIC SCIENCE AND ARTS.

Regular Course.

Advanced Elective Courses.

VII. THE LIBRARY SCHOOL.

VIII. SPECIAL COURSES IN ENGLISH LANGUAGE AND LITERATURE.

IX. DEPARTMENT OF PHYSICAL TRAINING.

X. DEPARTMENT OF EVENING COURSES.

XI. DEPARTMENT OF FREE PUBLIC LECTURES AND CONCERTS.

XII. DEPARTMENT OF EVENING CLASSES IN CHORAL MUSIC.

XIII. LIBRARY AND READING-ROOM.**XIV. MUSEUM AND PICTURE GALLERY.**

While each department is organized with reference to its special objects and courses of instruction, it sustains important relations to the other departments, and the various lines of work are carried on in so broad a spirit as to give a certain unity of purpose to the scope and ends of the institution as a whole.

BOARD OF TRUSTEES

President,

JAMES W. PAUL, JR.

Treasurer,

ANTHONY J. DREXEL

Secretary,

GEORGE C. THOMAS

Assistant Treasurer,

HERMAN DERUM

Until Third Thursday in October, 1903.

REV. W. B. BODINE, D. D.,

ANTHONY J. DREXEL,

RICHARD C. DALE,

JAMES W. PAUL, JR.,

JOSEPH G. ROSENGARTEN,

EDWARD T. STOTESBURY,

GEORGE C. THOMAS,

JOHN LOWBER WELSH.

Until Third Thursday in October, 1904.

JAMES C. BROOKS,

ALEXANDER W. BIDDLE, M. D.,

ADDISON B. BURK,

JOHN R. DREXEL,

ARTHUR E. NEWBOLD,

GEORGE I. MC LEOD, M. D.,

ALEXANDER VAN RENSSELAER,

WALTER GEORGE SMITH.

Until Third Thursday in October, 1905.

JOSEPH MOORE, JR.,

GEORGE W. C. DREXEL,

CHARLES E. ETTING,

J. DUNDAS LIPPINCOTT,

HERBERT M. HOWE, M. D.,

THEODORE N. ELY,

N. DUBOIS MILLER,

ALLEN EVANS.

President of the Institute,

JAMES MAC ALISTER, LL. D.

ADVISORY BOARD OF WOMEN

President,

MRS. ALEXANDER VAN RENSSELAER

Secretary,

MISS MARY DULLES

Until last Tuesday in October, 1903.

MRS. ALEX. VAN RENSSELAER,	MRS. GEORGE W. CHILDS,
MRS. EUGENE ELICOTT,	MRS. CHARLES E. DANA,
MRS. ROBERT K. CASSATT.	

Until last Tuesday in October, 1904.

MRS. ALEXANDER W. BIDDLE,	MRS. GEORGE W. C. DREXEL,
MRS. J. BELLANGEE COX,	MISS MARY DULLES,
MISS ELLEN DREXEL PAUL.	

Until last Tuesday in October, 1905.

MRS. ANTHONY J. DREXEL,	MRS. JOHN R. DREXEL,
MRS. C. HOWARD CLARK, JR.,	MRS. E. D. TOLAND,
MRS. J. G. WATMOUGH.	

OFFICERS OF INSTRUCTION AND ADMINISTRATION

JAMES MAC ALISTER, LL. D.,
President of the Institute.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

WILLIAM J. HOPKINS, S. B.,
Professor of Physics.

LIEUTENANT WILLIAM L. BAILIE, U. S. N.,
Director of the Department of Mechanic Arts, and
Professor of the Theory and Practice of the Steam-
Engine.

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

ALBERT P. BRUBAKER, M. D.,
Professor of Physiology and Hygiene.

ARTHUR J. ROWLAND,
Professor of Electrical Engineering.

A. THEODORE BRUEGEL,
Professor of Mechanical Engineering.

PARKE SCHOCH, A. M.,
Director of the Department of Commerce and Finance;
and Professor of the History and Mechanism of
Commerce, and of Stenography.

CLIFFORD P. GRAYSON,
Director of the School of Drawing, Painting, and
Modeling.

B. WEST CLINEDINST, N. A.,
Director of the School of Illustration.

ARTHUR TRUSCOTT,
Professor of Architecture.

16 OFFICERS OF INSTRUCTION AND ADMINISTRATION

- JAMES L. WOOD,
Instructor in Drawing from the Antique and in Artistic
Anatomy, and Lecturer on the History of Art.
- THOMAS SMITH, B. S., M. E.,
Professor of Mechanical Drawing.
- ABRAHAM HENWOOD, B. S.,
Assistant Professor of Chemistry.
- HOWARD S. RICHARDS, B. S.,
Professor of Building Construction.
- JOHN J. DULL,
Professor of Architectural Drawing and Design.
- PRESCOTT A. HOPKINS, M. S.,
Assistant Professor of Architecture.
- ALICE J. MORSE,
Director of the Courses in Design and Decoration.
- HARRIET L. MASON,
Professor of English Language and Literature.
- ALICE M. BRENNAN,
Director of the Junior and Elective Courses in Domestic
Science and Arts, and Instructor in English.
- HELEN M. SPRING,
Director of the Courses in Domestic Science.
- JOHN TODD HILL,
Instructor in Modeling and Wood-Carving.
- KATHARINE D. BROWN, B. S.,
Instructor in Mathematics.
- CHARLES D. CLARKSON,
Professor of the Theory and Practice of Accounts.
- CARL LEWIS ALTMAIER,
Professor of Commercial Law, and Instructor in Corre-
spondence and Typewriting.
- JOHN T. HOLDSWORTH,
Professor of Political Science and Banking.
- WILLIAM G. HAIMES,
Professor of Spanish.
- WILLIAM B. CREAGMILE,
Instructor in Electrical Engineering.

OFFICERS OF INSTRUCTION AND ADMINISTRATION 17

- _____,
Instructor in Physics.
- CAROLYN H. LOCKE,
Instructor in Stenography.
- ALICE ELIZABETH CHASE, B. A.,
Instructor in English and History.
- LILLIAN M. DALTON,
Instructor in English.
- RUTH COLLINS,
Instructor in English.
- ELIZABETH L. BLOOMFIELD,
Instructor in Drawing.
- HÉLÈNE ZOGBAUM,
Instructor in Design in the Dressmaking and Millinery
Courses.
- MAUDE G. HOPKINS,
Director of Physical Training.
- J. PETERSON RYDER, S. B.,
Director of Physical Training.
- EDWARD P. SIMON,
Instructor in Architectural Drawing.
- HOWARD H. DENN,
Instructor in Mechanical Drawing.
- EDWIN CARLK,
Instructor in Building Construction.
- THOMAS McCREIGHT,
Instructor in Forging.
- R. WILLETTE CLINGER,
Instructor in Woodwork.
- CLEMENT E. MOSSOP,
Instructor in Machine Construction.
- MARY E. FRATZ,
Instructor in Drawing.
- CORINNE M. ROCKWELL,
Secretary of the Art Department.
- BLAIR N. REILEY,
Instructor in charge of the Evening Courses in Mechan-
ical Drawing.

18 OFFICERS OF INSTRUCTION AND ADMINISTRATION

- H. J. BUR,**
Instructor in Mechanical Drawing.
- EDWARD C. MOORE,**
Instructor in Mechanical Drawing.
- FRANK T. WEILER,**
Instructor in Mechanical Drawing.
- FREDERICK L. LEWTON,**
Instructor in Chemistry.
- CHARLES E. BONINE,**
Instructor in Electrical Engineering.
- WILLIAM D. FORSTER,**
Instructor in Electrical Engineering.
- GEORGE A. PIERCE,**
Instructor in Electrical Engineering.
- GEORGE A. HUGGINS,**
Instructor in Mathematics.
- HOWARD D. HESS,**
Instructor in Mechanical Drawing.
- E. R. LUTZ,**
Instructor in Bookkeeping.
- WILLIAM M. MITCHELL,**
Instructor in Mathematics.
- ———,
Instructor in Invalid Cookery.
- MARGARET C. LIMERICK,**
Instructor in Cookery.
- HARRIET P. MITCHELL,**
Instructor in Bacteriology and Cookery.
- CAROLINE A. M. HALL,**
Director of the Courses in Dressmaking.
- EMILY G. SWETT,**
Director of the Courses in Millinery.
- MARY L. SARGENT,**
Instructor in Dressmaking.
- MARY E. EASTWOOD,**
Instructor in Dressmaking.

OFFICERS OF INSTRUCTION AND ADMINISTRATION 19

- JENNIE COLLINGWOOD,**
Instructor in Dressmaking.
- MARY HENLEIGH BROWN,**
Instructor in Sewing.
- LAURA E. WAGNER,**
Instructor in Dressmaking.
- MARY L. COMAR,**
Instructor in Sewing.
- CORA FOX,**
Instructor in Millinery.
- SOPHIA GLOECKNER,**
Instructor in Millinery.
- MARY C. DAVIS,**
Instructor in Dressmaking.
- NELLIE M. LOTZ,**
Instructor in Millinery.
- ROLAND W. WHITE,**
Assistant in the Chemical Laboratory.
- KATHARINE McCOLLIN,**
Instructor in Cookery.
- CLYDE WAGNER,**
Assistant in the Electrical Laboratory.
- MURRAY U. GROSS,**
Instructor in Bookkeeping.
- ELLA K. SCHOCH,**
Instructor in Stenography.
- GRACE GREENWOOD GREEN,**
Instructor in Physical Training.
-
- CHARLES M. SCHMITZ,**
Director of Music.
- JAMES M. DICKINSON,**
Organist.

20 OFFICERS OF INSTRUCTION AND ADMINISTRATION

LIBRARY

ALICE B. KROEGER,
Librarian, and Director of the Library School.
SARAH W. CATTELL,
Assistant Librarian, and Instructor in the Library School.
FANNIE S. MATHER,
Assistant Librarian, and Instructor in the Library School.
CHARLOTTE KENNEDY HANNUM,
Assistant in charge of the Circulating Department.
EMMA L. HELLINGS,
Evening Assistant in the Circulating Department.
MARY LOUISE ERSKINE,
Library Attendant.

MUSEUM

MARY T. MACALISTER,
Curator of the Museum.

OFFICES

FRANCES J. DILL,
Registrar.
MARY HEY SHAFFNER,
Clerk, Registrar's Office.
CAROLINE PRETTY,
Clerk, Registrar's Office.
ADÈLE MILLICENT SMITH,
President's Secretary.
CARRIE M. NELSON,
Clerk in charge of Supply-room.
E. THERESE GREGG,
Superintendent of the Students Restaurant.

BUILDINGS

WILLIAM A. FLETCHER,
Chief Engineer and Superintendent of Buildings.
ROBERT J. Mc GOWAN, }
JOHN BURLEIGH, } Janitors.



THE AUDITORIUM.

DEPARTMENTS
AND
COURSES OF INSTRUCTION

DEPARTMENTS

The Institute is organized in the following Departments and Courses :

I. DEPARTMENT OF FINE AND APPLIED ART

School of Drawing, Painting, and Modeling.

School of Illustration.

School of Design and Decoration.

School of Architecture.

II. DEPARTMENT OF SCIENCE AND TECHNOLOGY

School of Engineering. Systematic Courses in Electrical and Mechanical Engineering.

A Preparatory Course of one year is provided for students not ready to take up the Engineering Courses.

School of Mechanic Arts. Systematic Course in Mathematics, Mechanical Drawing, Free-hand Drawing, Chemistry, Physics, English Language and Literature, History, Civics, Shop-work in Wood and Iron, Applied Electricity.

Course in Mechanical Drawing.

Course in Machine Construction.

SPECIAL COURSES IN SCIENCE

Mathematics : Algebra, Geometry, Mechanics, Trigonometry, Analytical Geometry, Surveying, Calculus.

Theoretical and Practical Physics.

Chemistry: General Chemistry, Qualitative and Quantitative Analysis, Organic Chemistry, Foods and Dietetics, Chemistry of Textiles.

III. DEPARTMENT OF COMMERCE AND FINANCE

School of Commerce and Finance.

Commercial Course for Teachers.

Office Courses : Secretary, Bookkeeping, Stenography.

IV. DEPARTMENT OF DOMESTIC SCIENCE

Courses in Household Economy and Cookery.

Normal Course in Domestic Science.

V. DEPARTMENT OF DOMESTIC ARTS

Courses in Dressmaking.

Courses in Millinery.

Normal Course in Domestic Arts.

VI. DEPARTMENT OF JUNIOR DOMESTIC SCIENCE
AND ARTS

Systematic Course for Young Women, embracing English Language and Literature, Mathematics, General Chemistry, Physiology and Hygiene, General History, English History, Free-hand Drawing, Business Cus-

toms and Accounts, Principles and Practical Training
in Domestic Science and Arts.

Advanced Elective Courses in the foregoing subjects.

VII. THE LIBRARY SCHOOL

Systematic Course in the Theoretical and Practical Training
of Librarians.

VIII. COURSES IN ENGLISH LANGUAGE AND LITERATURE

Rhetoric, Prose Style, American Literature, English Literature,
Contemporary Poets, Victorian Poets.

IX. DEPARTMENT OF PHYSICAL TRAINING

Institute Classes for Students.

Special Courses for Young Women.

X. DEPARTMENT OF EVENING COURSES

Special Courses in all the Departments of the Institute.

One session, from October 1 to March 31.

Systematic Courses extending over two and three years,
for which Certificates are granted.

XI. DEPARTMENT OF FREE PUBLIC LECTURES AND
CONCERTS—DURING THE WINTER MONTHS

Afternoon and Evening Courses of Lectures in Art, Science,
History, Literature, Technology, etc.

Weekly Organ Recitals and Concerts.

**XII. FREE EVENING CLASSES IN CHORAL MUSIC—FROM
OCTOBER 1 TO MARCH 31.**

The Choral Class. General Training in Choral Music.

The Drexel Chorus. Advanced Training in Oratorio Music.

XIII. LIBRARY AND READING-ROOM

The Library contains 30,000 volumes. Open free to the public, daily, except on Sundays and legal holidays.

XIV. MUSEUM AND PICTURE GALLERY

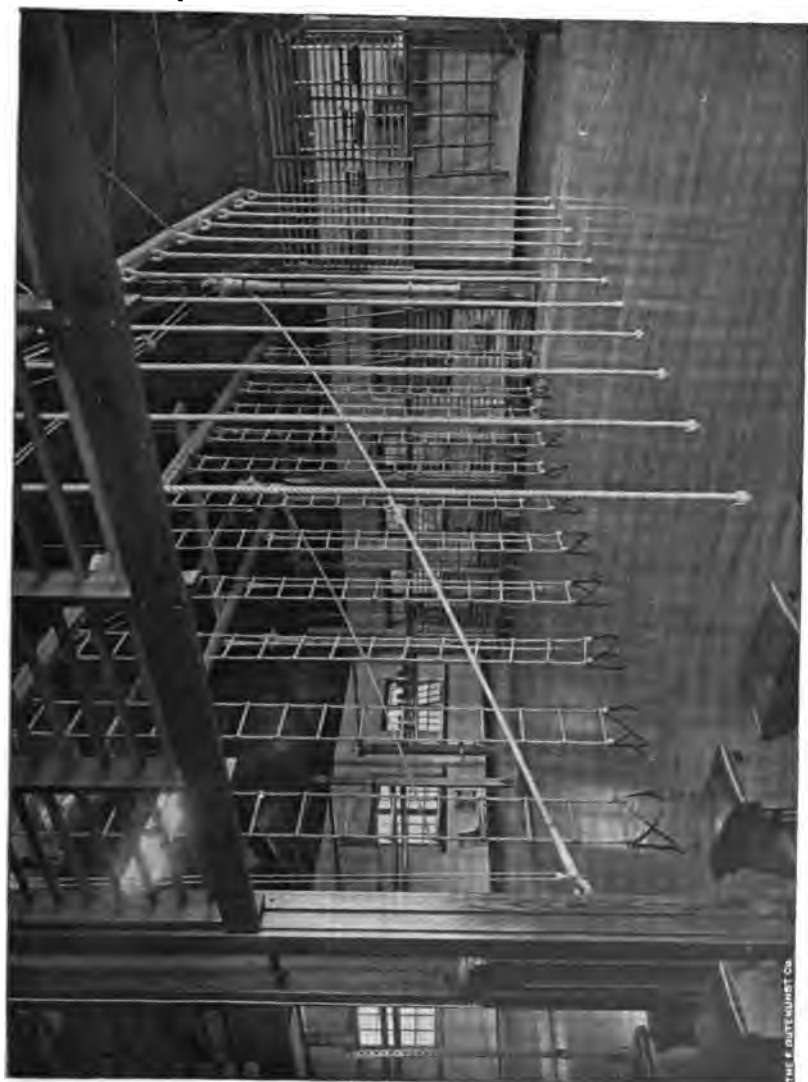
The Museum contains valuable and important collections of textiles, wood-carvings, metal-work, ceramics, casts, drawings, and prints.

The Picture Gallery contains The John D. Lankenau Collection and the paintings bequeathed to it by the founder.

The Museum and the Picture Gallery are open free to the public, daily, except on Sundays and legal holidays, from 9 a. m. to 4 p. m., and on stated evenings during the winter months.

While some of the courses are specially designed for either young men or young women and are quite distinct in their arrangement and management, all the general courses are open to both sexes, on the same terms and conditions.

The academic year is divided into two terms beginning, respectively, in September and February.



GYMNASIUM.

THE F. GUTENBERG CO.

DEPARTMENT OF FINE AND APPLIED ART

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

B. WEST CLINEDINST, N. A.,
Director of the School of Illustration.

CLIFFORD P. GRAYSON,
Director of the School of Drawing, Painting, and Modeling ; Life Classes.

JAMES L. WOOD,
Drawing from the Antique, Artistic Anatomy, and the History of Art.

ARTHUR TRUSCOTT,
Professor in charge of the Courses in Architecture.

ALICE J. MORSE,
Director of the Courses in Design and Decoration.

JOHN TODD HILL,
Instructor in Modeling in Clay and Wood-Carving.

HOWARD S. RICHARDS, B. S.,
Professor of Building Construction.

JOHN J. DULL,
Professor of Architectural Drawing and Design.

PRESCOTT A. HOPKINS, M. S.,
Assistant Professor of Architecture.

ELIZABETH L. BLOOMFIELD,
Instructor in Drawing.

HÉLÈNE ZOGBAUM,
Instructor in Design in Dressmaking and Millinery.

MARY E. FRATZ,
Instructor in Drawing.

CORINNE M. ROCKWELL,
Secretary of the Department.

The Department is organized as follows :

SCHOOL OF ILLUSTRATION.

SCHOOL OF DRAWING, PAINTING, AND MODELING.

SCHOOL OF DESIGN AND DECORATION.

SCHOOL OF ARCHITECTURE.

SCHOOL OF ILLUSTRATION

B. WEST CLINEDINST, N. A., Director and Instructor.

The School of Illustration comprises the following classes :

I. MORNING CLASS.—LIFE CLASS STUDYING FROM THE DRAPED AND COSTUMED MODEL. The model poses from 9 a. m. until 12 m. The model and costume are changed each week.

II. AFTERNOON CLASS.—From 1 to 4 p. m. In this class the model poses in costume different in character from that of the Morning Class.

In both the Morning and the Afternoon Class, instruction is given in the various mediums in black and white adapted to the purposes of illustration, and to reproductive work in general, such as drawing, painting in oil, wash, pen and ink, crayon, charcoal, and pencil. Special attention is given to advancing the student in the more practical mediums of wash and pen drawing.

III. COMPOSITION CLASS.—CRITICAL LECTURES IN PRACTICAL ILLUSTRATION. Monday of each week, from 3 to 4 p. m.

These lectures are for the purpose of instructing the student in composition and costume, and in the necessary requirements for converting the study of the draped or costumed model into a finished picture.

IV. WATER-COLOR CLASS.—From 9 a. m. to 12 m., daily. A class in connection with the Morning Illustration Class is instructed by Mr. Clinedinst in Water-Color, from the costumed model and accessories. The number of students that can be received is limited.

The fee admits to all the privileges of the Life Classes in the Art Department.

V. SKETCH CLASS FROM THE COSTUMED MODEL.—This class meets on Thursday of each week from 3 to 4 p. m. The class is open to students who are not members of other classes in the Institute.

REQUIREMENTS FOR ADMISSION

MORNING OR AFTERNOON CLASS.—Applicants must submit satisfactory drawings or sketches of the draped or costumed model, or else an illustration that has been published in a book, magazine, or an illustrated newspaper.

WATER-COLOR OR SKETCH CLASS.—Applicants must submit a drawing from the antique or a sketch from life.

FREE SCHOLARSHIPS

A limited number of free scholarships is offered to those who have spent at least two years in the School of Illustration, and who, after leaving the school, have shown conspicuous ability in that department of art work. These scholarships are granted at the discretion of the Faculty of

the Art Department, and entitle the holders to admission to such classes as will furnish opportunity for further improvement.

SCHOOL OF DRAWING, PAINTING, AND MODELING

CLIFFORD P. GRAYSON, Director

FIRST CLASS

DRAWING FROM GEOMETRIC SOLIDS.

CAST DRAWING FROM SIMPLE ORNAMENT.

FREE-HAND AND LINEAR PERSPECTIVE.—Lectures and problems.

DRAWING.—Still-life and interiors.

FREE-HAND SKETCHING FROM OBJECTS.

DRAWING FROM CASTS OF HANDS, FEET, AND SIMPLE MASKS.

CLAY MODELING.—Lines, symmetry, ornament.

SECOND CLASS

CAST DRAWING FROM COMPLICATED ORNAMENT.

DRAWING FROM CASTS OF PARTS OF HUMAN FIGURE AND ANIMALS.

ANTIQUE BUST AND TORSO.—Drawing and monochrome in oil.

ANTIQUE DRAWING.—Full-length figure.

DRAWING FROM LIFE.

SKETCHING FROM OBJECTS.—Pencil and crayon.

ARTISTIC ANATOMY.—Lectures and drawings.

CLAY MODELING.—Value of planes studied from casts of natural foliage and parts of human figure.

THIRD CLASS

DRAWING FROM FULL-LENGTH ANTIQUE.

DRAWING FIGURE FROM LIFE.

PAINTING FROM LIFE.—Head and costumed figure.

PAINTING IN OIL AND WATER COLOR.—Still-life.

SKETCHING.—From costumed figure.

LECTURES ON COMPOSITION.

ARTISTIC ANATOMY.—Lectures and drawing.

CLAY MODELING.—Full-length figure, torso, and head from casts.

LECTURES ON THE HISTORY OF ART.

FOURTH CLASS.

DRAWING FIGURE FROM LIFE.

PAINTING FROM LIFE.—Full figure.

PORTRAIT PAINTING.

COMPOSITION AND SKETCHING.

CLAY MODELING.—Bust, bas-relief, and full figure from life.

LECTURES ON THE HISTORY OF ART.

The lectures on composition are given by Mr. Clinedinst.

It is expected that students will accomplish the work of each class in one year. The year is divided into two terms of nearly equal length.

On entering the school, each student is placed immediately in the class for which he or she is best fitted, and advancement thereafter is regulated by the judgment of the instructors.

If, at the end of three terms, a student has not progressed sufficiently to enter the Antique Class, or if, at the end of

two terms, a student of the Antique Class is not prepared to enter the Life Class, he will be considered as lacking in either application or artistic ability, and may, at the discretion of the Faculty, be dropped from the class.

No definite time can be assigned for completing a course of training in art, but at the end of four years, or eight terms, a certificate is granted to students who have attended regularly and have done satisfactory work in the studies pursued. It should be understood, however, that any of the several lines of work in the Fourth Class may be carried as far as the successful achievement of the student warrants.

REQUIREMENTS FOR ADMISSION

FIRST CLASS.—Applications must be approved by the Directors.

SECOND CLASS.—A drawing from a plaster mask or fragment of a figure.

THIRD CLASS.—One or more drawings made from the cast and other objects.

FOURTH CLASS.—Applicants are required to submit specimens of work from the antique or from life.

SPECIAL COURSES

Special students are admitted for the study of any of the subjects embraced in the above courses.

COURSE IN CLAY MODELING

This course is designed to give artistic training especially adapted to the needs of those desirous of devoting themselves to the study of decorative sculpture in terra-cotta and

stone as applied to buildings, and also to the needs of artisans and designers in silver, bronze, iron, and other forms of industrial products to which modeled ornament is applicable.

While in other respects the course of training is similar to that in the School of Drawing, Painting, and Modeling, a considerable portion of the student's time is devoted to designs practically available in decorative work.

COURSE IN WOOD-CARVING

A practical course in wood-carving and its applications to the various forms of industrial production.

The course embraces a study of the nature and use of tools, elementary exercises in carving, ornament of various kinds, original designs for panels, carved enrichments for furniture, frames, architectural decoration, etc.

For admission to this course, applicants should be proficient in free-hand drawing and elementary clay modeling.

Students who have not had this training divide their time between the classes in these branches and the work in carving.

Students have the privilege of attending the lectures on historic ornament and the architectural styles which are given at stated times during the year.

SCHOOL OF DESIGN AND DECORATION

This School is intended for the training of professional designers, and occupies three years. It provides thorough instruction in the principles of historic ornament and decorative design, and in the technical methods of their practical application to wall-paper, textiles, wood-work, metal-work, furniture, posters, book-covers, etc.

Full information concerning this school will be found on page 39.

SCHOOL OF ARCHITECTURE

A two-years' course in Free-hand Drawing, Ornament, the Orders of Architecture, Working Drawings, Perspective, Shades and Shadows, Sketching, Architectural Design, Measured Drawings, Planning of Buildings, Pen and Ink Rendering, Water-Color Rendering, Specifications and Contracts, with Lectures on the more important technical subjects connected with architectural work.

Full information concerning this course will be found on page 45.

PHYSICAL TRAINING

Students enrolled in any of the Art courses have the privilege of attending the Institute classes in Physical Training twice a week without additional charge. The training is carried on under the immediate supervision of Miss Hopkins and Mr. Ryder, the Directors.

The studios and class-rooms in all the schools and courses are open five days a week, from 9 a. m. to 4 p. m.

The accommodations of the Art Department are ample, the various rooms and studios being fitted with every requirement and convenience for the different kinds of work pursued.

All the work done by the students is subject to the control of the department until the close of the term or school year.

The Institute reserves the right to retain at least one specimen of work done by each student of each class.

SCHOLARSHIPS

GRADUATE SCHOLARSHIPS.—A limited number of free scholarships is offered to those who have received the certificate which is awarded in the School of Drawing, Painting, and Modeling, and who, after finishing the course, have shown conspicuous ability. These scholarships are granted at the discretion of the Faculty of the Art Department, and entitle the holders to admission to such classes as will furnish opportunity for further improvement.

THE FRANCES DREXEL PAUL SCHOLARSHIP.—Mr. James W. Paul, Jr., President of the Board of Trustees, has established an annual scholarship in memory of his wife, to be known as THE FRANCES DREXEL PAUL SCHOLARSHIP. The scholarship, which is of the value of one hundred dollars, may be given to one student or divided between two students; and, in the judgment of the Faculty, free tuition may be given in addition to the amount of money awarded. This scholarship is open to students who have spent at least one year in any course of this department, and will be awarded at the concours held at the end of each academic year.

PRIZES

The ANTHONY J. DREXEL PRIZES and the JOHN R. DREXEL PRIZES are awarded in the Department of Fine and Applied Art, at the end of each academic year, and at the close of the session of the Evening Classes. The prizes consist of sums of money divided among the several schools. They are given on the recommendation of juries selected by the Directors of the Art Department.

MUSEUM AND PICTURE GALLERY

The department is supplied with an extensive collection of plaster casts, representative of the sculpture of the classic and Renaissance periods, and with valuable collections of drawings, designs, prints, and photographs. The collections of textiles, wood-carvings, metal-work, and ceramics in the Museum of the Institute are of great value in connection with the various lines of instruction. The Picture Gallery contains The John D. Lankenau Collection of paintings, in which are found examples of work by the leading artists of the German, French, Italian, and other schools. There is also a collection of pictures bequeathed to the Institute by its founder, containing representative work by French and Spanish painters.

LIBRARY

In the Library of the Institute, which contains thirty thousand volumes, there is an extensive collection of valuable art and illustrated books arranged in a separate alcove, to which the students have free access.

The Reading-room is supplied with the leading art periodicals.

FEES AND TERMS

SCHOOL OF ILLUSTRATION

Morning Class and Critical Lectures, *twenty dollars* per term.

Afternoon Class and Critical Lectures, *twenty dollars* per term.

Morning and Afternoon Classes and Critical Lectures, *twenty-five dollars* per term.

Critical Lectures, *ten dollars* per term.

Critical Lectures for members of the School of Drawing, Painting, and Modeling, *five dollars* per term.

Water-Color Class, *twenty-five dollars* per term. The fee admits to all the privileges of the Life Classes in the Art Department.

Sketch Class, *five dollars* per term.

SCHOOL OF DRAWING, PAINTING, AND MODELING

First class, *twelve dollars* per term ; second class, *twelve dollars* per term ; third and fourth classes, *fifteen dollars* per term, each.

SPECIAL STUDENTS

In Water-Color, Oil Painting, Still-life, Drawing or Painting from Life, or Clay Modeling, *fifteen dollars* per term.

COURSE IN CLAY MODELING

Fifteen dollars per term.

COURSE IN WOOD-CARVING

Wood-Carving only, *fifteen dollars* per term. Wood-Carving with Drawing and Clay Modeling, *twenty dollars* per term.

There are two terms in the year, beginning, respectively, in September and February.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

A deposit of *fifty cents* is required of each student, as security for the return of the locker key. A deposit of *fifty cents* additional, as security for the return of the key of the locker in the gymnasium, is required of each student taking physical training.

A storage-room for bicycles, in the basement, is provided by the Institute, free of charge. An individual check for each bicycle is given by the attendant.

ADMISSION

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

EVENING CLASSES

The Evening Classes extend through six months of the year, from October to March, inclusive.

Instruction is given in the following subjects : Free-hand Drawing from the Cast, Drawing from the Antique, from Life, Modeling in Clay, Architectural Drawing, Building Construction, Design, Pen and Ink Rendering, Water-Color Rendering, Wood-Carving.

Full details of these classes will be found on page 202.

SCHOOL OF DESIGN AND DECORATION

INSTRUCTORS

- ALICE J. MORSE**, Director,
Design and Decoration.
- PRESCOTT A. HOPKINS**, M. S.
Architectural Styles.
- ELIZABETH L. BLOOMFIELD**,
Drawing.
- CLIFFORD P. GRAYSON**,
Figure Painting.
- JOHN TODD HILL**,
Modeling and Wood-Carving.
- JAMES L. WOOD**,
The History of Art.
- JOHN J. DULL**,
Water-Color Rendering.
- R. WILLETTE CLINGER**,
Joinery.
- THOMAS MC CREIGHT**,
Forging.
- MAUDE G. HOPKINS** and **J. PETERSON RYDER**, S. B.,
Directors of Physical Training.

The School of Design and Decoration is intended for the training of professional designers, and occupies three years. It provides thorough instruction in the principles of historic ornament and decorative design, and in the technical methods of their practical application to wall-paper, textiles, woodwork metal-work, furniture, ceramics, book-covers, etc.

COURSE OF INSTRUCTION

JUNIOR YEAR

FIRST TERM

Study of drawing and color, from objects in the Museum, with special reference to the later work in actual design. Principles of design and composition. Perspective. Modeling. Physical training.

SECOND TERM

History of ornament. Lettering. Application of simple ornament to textiles, etc. Modeling. Physical training.

MIDDLE YEAR

FIRST TERM

History of ornament continued. Development of ornament and its adaptation to special forms and materials—textiles, wall-surfaces, inlay-mosaics, etc. Modeling. Wood-carving.

SECOND TERM

Designs for stencils, textiles (woven and printed), furniture, wrought-iron, brass, silver, pottery, china, book-covers, wall-papers, leather, posters, etc. Studies from nature in water-color. Principles of conventionalization. Lectures on the history of art. Wood-carving.

SENIOR YEAR

FIRST TERM

The work of this term is largely a continuation of that of the previous term, with the addition of the study of interior decoration as a whole. Studies from nature. Lectures on the history of art and on stained glass. Wood-carving (optional).

SECOND TERM

Applied design—the making of designs which are salable

and capable of reproduction and manufacture. Lectures on the history of art. Wood-carving (optional).

During this term, attention is given to rendering, as well as to the purely artistic side of the work.

Students may elect to spend a portion of this year in drawing from life and in the study of artistic anatomy.

Through the entire course the students make as many drawings and color-studies as possible, as an aid in working out the problems and as a means of cultivating their artistic and decorative sense.

GRADUATE COURSES

For students desirous of devoting more time to applied work in design and decoration than is possible in the regular course, graduate courses are provided in the following subjects :

THE DRAPED FIGURE WITH REFERENCE TO DECORATIVE PURPOSES.

WOOD-CARVING AND JOINERY.—Furniture, mantels, paneling, etc.

STAINED GLASS.—For ecclesiastical and domestic purposes.

HOUSE DECORATION.—Interiors, hangings, etc.

ARCHITECTURAL DECORATION.—Modeling of details for architectural work in terra-cotta, marble, etc.

ORNAMENTAL IRONWORK.—Grilles, railings, gates, knockers, etc.

In these courses, practical instruction is given in the studios and workshops, and designs in various materials are actually carried out by the students. The collections in the Museum are especially valuable in connection with

the applied work. The studios and workshops afford ample opportunity for working out the designs.

The Class in the Draped Figure is intended to enable students to use decorative motives derived from the living model.

These courses are open to graduates of the regular course, and to other students who have had the necessary preparation in the principles of design, historic ornament, and practical designing.

PHYSICAL TRAINING

Students are required to attend the Institute classes in physical training twice a week during the first year of the course, and have the privilege of attending throughout the three years. No additional fee is charged.

DIPLOMA

A diploma is awarded to students who complete the regular course and pass all the required examinations.

SPECIAL COURSES

For those unable to devote the time required for the full course, Special Courses in Applied Design will be arranged in accordance with individual needs, provided such applicants have had previous experience in work of this kind, or are fitted to profit by the instruction.

ATTENDANCE

Students taking the regular course are required to attend from 9 a. m. until 4 p. m., from Monday to Friday, inclusive.

MUSEUM AND ART COLLECTIONS

Students have the advantage of carrying on their work in immediate connection with the Museum, which contains extensive collections representing the decorative arts of Egypt, India, China, Japan, and the countries of Europe. The collections of European textiles, dating from the fourteenth century, and of India printed cloths are worthy of special mention.

Besides these, there are collections of plaster casts, representative of the sculpture of the classic and Renaissance periods, and valuable collections of drawings, designs, prints, and photographs.

The Picture Gallery contains The John D. Lankenau Collection of paintings, and the pictures bequeathed to the Institute by its founder.

LIBRARY

The Library is supplied with an extensive collection of books in fine and applied art, embracing many important and valuable works on design and decoration. The best periodicals relating to these subjects are supplied in the Reading-room.

ADMISSION

A good general English education is advisable for students entering the School. Students under eighteen years of age are advised not to undertake the work. Some previous experience in the use of water-color is of advantage to students. All applicants must submit drawings of sufficient merit to warrant their admission to the

School. The necessary preparatory training in drawing can be obtained in the School of Drawing, Painting, and Modeling, in the Institute.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEEES AND TERMS

Regular Course, *fifteen dollars* per term.

Graduate Course, *twenty dollars* per term.

A deposit of *fifty cents* is required of each student, as security for the return of the locker-key. A deposit of *fifty cents* additional, as security for the return of the key of the locker in the Gymnasium, is required of each student taking physical training.

There are two terms in the year, beginning, respectively, in September and February.

SCHOOL OF ARCHITECTURE

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

- ARTHUR TRUSCOTT,
Professor of Architecture.
- PRESCOTT A. HOPKINS, M. S.,
Assistant Professor of Architecture.
- CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.
- HARRIET L. MASON,
Professor of English Language and Literature.
- ELIZABETH L. BLOOMFIELD,
Instructor in Drawing from the Cast.
- ALICE ELIZABETH CHASE, B. A.,
Instructor in General History.
- JAMES L. WOOD,
Lecturer on the History of Art.
- PROFESSOR ARTHUR J. ROWLAND,
Lecturer on Electrical Lighting.
- PROFESSOR A. THEODORE BRUEGEL,
Lecturer on Steam Heating.
- PROFESSOR JOHN T. HOLDSWORTH,
Lecturer on Business Customs.
- R. WILLETTE CLINGER,
Instructor in Wood-Turning.
- J. PETERSON RYDER, S. B.,
Director of Physical Training.

The course of study in Architecture aims to give students such general training in drawing, design, decoration, and building construction as will enable them to become successful architectural draftsmen. This general artistic training is supplemented by the study of mathematics, general history, and English. The course, in fact, is extensive and thorough enough to equip students for professional work on their own account, after the necessary drill and experience which can only be obtained in an architect's office. While practical training is strongly emphasized, stress is laid upon the artistic work of the students, and special attention is given to rendering in pen, pencil, and brush. The lectures on the history of architecture furnish a comprehensive knowledge of the development and growth of the various styles.

The course occupies two years, a large share of the time being devoted to purely architectural work.

COURSE OF INSTRUCTION

JUNIOR YEAR

FIRST TERM

STUDY OF THE ORDERS OF ARCHITECTURE from Vignole and actual examples.

PERSPECTIVE.—Theoretical principles.

SHADES AND SHADOWS.

SKETCHING from photographs, casts, and buildings, in pencil.

HISTORIC ORNAMENT.—Greek, Roman, Byzantine, in line and color.

BUILDING MATERIALS.—Kinds and qualities of materials used for building purposes.

BUILDING CONSTRUCTION.—Working drawings and principles of heating, ventilating, and plumbing.

MATHEMATICS.—Review of arithmetic, giving special attention to decimals, ratio and proportion, percentage, square root, metric system, practical measurements. Elementary algebra through simple fractions.

ENGLISH.—Principles of composition and exercises in writing.

GENERAL HISTORY.—Greek history.

SECOND TERM

STUDY OF THE ORDERS OF ARCHITECTURE, continued.

PERSPECTIVE.—Practical exercises.

SKETCHING, continued.

HISTORIC ORNAMENT.—Romanesque, Moresque, Gothic, Renaissance, in line and color.

GRAPHICAL STATICS.—Essential elements for practical work.

MATHEMATICS.—Algebra through quadratics, including only the simplest forms in simultaneous quadratics and radicals. Practical geometry.

ENGLISH.—Principles of composition and exercises in writing.

GENERAL HISTORY.—Roman and medieval history.

BUILDING LAWS.—The more important statutes on the subject.

Illustrated lectures on the history of architecture throughout the year.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

SENIOR YEAR

FIRST TERM

ARCHITECTURAL DESIGN.

ARCHITECTURAL ORNAMENT AND DECORATION.

MEASURED DRAWINGS from actual measurements of buildings.

CONSTRUCTIVE DESIGN, APPLIED STATICS, STRENGTH OF
MATERIALS, with laboratory work.

SKETCHING in pencil and wash.

PEN AND INK RENDERING.

WATER-COLOR RENDERING.

MATHEMATICS.—Essentials of plane trigonometry, including drill in use of logarithmic tables and solution of right and oblique triangles. Practical geometry and mensuration.

WOOD-TURNING.—Designing and shopwork.

HISTORY.—Modern European History.

SPECIFICATIONS.

SECOND TERM

ARCHITECTURAL DESIGN.

ARCHITECTURAL ORNAMENT AND DECORATION, continued.

SKETCHING, continued.

MEASURED DRAWINGS, continued.

CONSTRUCTIVE DESIGN.

WATER-COLOR RENDERING, continued.

PEN AND INK RENDERING.

STEREOTOMY.

PLANNING OF BUILDINGS.—Theses.

MATHEMATICS.—Elementary mechanics. Elements of plane surveying and leveling—recitation and field-work.

SPECIFICATIONS. CONTRACTS. ESTIMATES.

LECTURES ON ELECTRICAL LIGHTING.

LECTURES ON HEATING AND VENTILATING.

BUSINESS FORMS AND CUSTOMS.

Illustrated lectures on the history of architecture throughout the year.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

Students attend five days a week, from 9 a. m. to 3 p. m., with an hour's recess in the middle of the day.

The appliances of the department include a 200,000-pound testing-machine, built by Tinius Olsen, which is arranged for tensile, compressive, and transverse tests, and for the testing of cement, etc.

As occasion requires, visits are made to important buildings, to illustrate the practical application of principles presented in class.

DIPLOMA

A diploma is granted to students who complete the course and pass all the required examinations.

GRADUATE COURSE

For students desirous of devoting more time to preparation for actual work, a Graduate Course of one year is provided. This course embraces advanced work in the following subjects :

ARCHITECTURAL DESIGN.

CONSTRUCTIVE DESIGN.

APPLIED STATICS.**RENDERING IN PENCIL, BRUSH, OR PEN.****STRENGTH OF MATERIALS.—Laboratory Work.****DETAILING.—Office Practice.****SPECIFICATIONS.****PAPERS IN ARCHITECTURAL HISTORY.****ELECTIVE WORK IN ADVANCED MATHEMATICS.****ENGLISH LANGUAGE AND LITERATURE.—Elective.**

A special certificate is granted to students who complete satisfactorily the Graduate Course.

GYMNASIUM

The Gymnasium is a large, airy room completely equipped in accordance with the requirements of the Swedish system of physical training and with dressing-rooms, and bath-rooms supplied with hot and cold water. All the training is conducted under the immediate supervision of the Director.

LIBRARY AND MUSEUM

In the Library there is an extensive collection of valuable and important works on architecture, and the leading periodicals relating to the subject are supplied in the Reading-room.

The collections in the Museum afford ample opportunity for the study of the industrial arts allied to architecture. The decorative arts of Egypt, India, China, Japan, and Europe are well represented.

ADMISSION

It is desirable that applicants should have a secondary education. The examination for admission includes English grammar and composition, arithmetic, United States history, and proficiency in mechanical and free-hand drawing. The necessary preparatory training in drawing can be obtained in other departments of the Institute. Entrance examinations are held in June and September.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Regular Course, *thirty dollars* per term. Graduate Course, *thirty-five dollars* per term.

Students provide their own drawing instruments, textbooks and stationery.

Coat-lockers, with individual combination locks, giving students the absolute control of their own property, are supplied in the main building at a rental of *fifty cents* per term for each student.

There are two terms in the year, beginning, respectively, in September and February.

EVENING CLASSES

In the Evening Classes, systematic instruction is given in Architectural Drawing and Design, Building Construction, and House Construction.

The session extends through six months, from the beginning of October to the end of March.

FEES.—From *four dollars* to *six dollars*, according to the course taken, for the entire session of six months.

Full details will be found on page 202.

DEPARTMENT OF SCIENCE AND TECHNOLOGY

SCHOOL OF ELECTRICAL AND MECHANICAL ENGINEERING

Among the professions of to-day, Engineering takes high rank. This has come about as a result of the vital relations existing between it and modern life. The work of the engineer contributes on every side to the comfort, welfare, and advancement of society. It is impossible to exaggerate the magnitude and importance of the undertakings which are devised and executed in this department of applied science, while the ever-expanding fields of usefulness into which it seeks admission are almost limitless. The young man who hopes to enter the engineering profession with fair prospects of success must be equipped with such thorough scientific and technical training as is rarely obtained except by systematic and carefully directed study. The technical school provides exceptional facilities for such instruction and is organized for this purpose.

The School of Engineering in the Drexel Institute offers two courses: one in Electrical Engineering and the other in Mechanical Engineering, each of two years' duration. These are complete engineering courses, and the work is accomplished in the prescribed length of time only by basing it upon extended preparation, by taking account of such practical experience as the student may have had, and by requiring close application on his part. Every hour of

the scheduled day is filled with assigned work. The classes are limited as to size, so that the student is brought daily in close personal contact with the heads of departments as well as with the instructors.

The first year is the same for both courses. It includes those portions of engineering study and training required alike by the electrical and the mechanical engineer. At the beginning of the second year the two courses diverge, and from that time forward the student devotes his time to the work of the course he has elected.

While the training is essentially technical, certain subjects indirectly related to engineering matters are included in the curriculum. The student's use of English in the written matter submitted by him in connection with the Laboratory and Seminary Work is carefully supervised all through the course. A course in Business Methods is provided, which introduces the student to a knowledge of such business affairs as he will be sure to encounter no matter what position he may be called to fill in after life. The Seminary Work is intended chiefly to broaden the scope of the course by acquainting the student with current engineering literature and with the most recent developments of the science.

Philadelphia, as one of the greatest centres of manufacturing industry in the world, offers wide opportunity to become familiar with the varied developments of modern engineering. Use is made of the advantages thus afforded, to inspect power plants and manufacturing establishments, and to make occasional tests of the machinery installed in them.

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

ARTHUR J. ROWLAND,
Professor of Electrical Engineering.

A. THEODORE BRUEGEL, M. E., M. M. E.,
Professor of Mechanical Engineering.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

WILLIAM J. HOPKINS, S. B.,
Professor of Physics.

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

THOMAS SMITH, B. S., M. E.,
Professor of Mechanical Drawing.

ABRAHAM HENWOOD, B. S.,
Assistant Professor of Chemistry.

WILLIAM B. CREAGMILE,
Instructor in Electrical Engineering.

_____,
Instructor in Mechanical Engineering.

_____,
Instructor in Physics.

OFFICERS OF OTHER DEPARTMENTS GIVING INSTRUCTION IN THE
ENGINEERING SCHOOL

PRESCOTT A. HOPKINS, M. S.,
Assistant Professor of Architecture.

JOHN T. HOLDSWORTH,
Professor of Political Science and Banking.

H. L. MASON,
Professor of English Language and Literature.

CLEMENT E. MOSSOP,
Instructor in Machine Construction.

R. WILLETTE CLINGER,
Instructor in Woodwork and Pattern-making.

THOMAS MCCREIGHT,
Instructor in Forging.

COURSES OF INSTRUCTION

ELECTRICAL AND MECHANICAL ENGINEERING

JUNIOR YEAR

COMMON TO BOTH COURSES

SUBJECT	Scheduled hours per week		
	Lab'y or Drawing	Rec't'n or Lecture	Total No. Hours
FIRST TERM			
Mathematics—Calculus	—	5	5
Chemistry—Qualitative Analysis	3	1	4
Physics	3	2	5
Mechanics of Materials	—	3	3
Principles of Mechanism	3	1	4
Electricity—General Theory	—	3	3
Mechanical Engineering Laboratory	3	—	3
Electrical Engineering Laboratory	3	—	3
English, one hour bi-weekly	—	—	—
Engineering Seminary, bi-weekly	—	—	—
	15	15	30
SECOND TERM			
Mathematics—Calculus	—	5	5
Technical Chemistry	3	1	4
Materials of Engineering	—	1	1
Mechanics of Machinery	—	2	2
Machine Design and Drawing	6	—	6
Steam-Boilers	—	2	2
Electric Power Generation and Distribution	—	4	4
Electrical Engineering Laboratory	3	—	3
Mechanical Engineering Laboratory	3	—	3
English, one hour bi-weekly	—	—	—
Engineering Seminary, bi-weekly	—	—	—
	15	15	30

SENIOR YEAR
IN ELECTRICAL ENGINEERING

SUBJECT	Scheduled hours per week		
	Lab'y or Drawing	Rec't'n or Lecture	Total No. Hours
FIRST TERM			
Electro-Magnets	—	3	3
Alternating Currents	—	3	3
Telephones and Telephone Systems	—	2	2
Telegraphs and Signal Systems			
Electro-Chemistry	—	2	2
Thermodynamics and the Steam-Engine	—	3	3
Electrical Drawing and Design	3	—	3
Electrical Engineering Laboratory	9	—	9
Mechanical Engineering Laboratory	3	—	3
Building Construction	—	2	2
Business Methods			
English, one hour bi-weekly	—	—	—
Engineering Seminary, bi-weekly	—	—	—
Visits of Inspection, monthly	—	—	—
	15	15	30
SECOND TERM			
Dynamo Design	—	4	4
Electrical Engineering			
Alternating Currents	—	3	3
Telegraphs and Signal Systems	—	2	2
Electrical Measuring Instruments			
Steam Machinery, Gas- and Oil-Engines, Me- chanical Refrigeration	—	4	4
Hydraulic Machinery	—	2	2
Electrical Design	3	—	3
Mechanical Engineering Laboratory	3	—	3
Electrical Engineering Laboratory	9	—	9
English, one hour bi-weekly	—	—	—
Engineering Seminary, bi-weekly	—	—	—
Visits of Inspection, monthly	—	—	—
	15	15	30

SENIOR YEAR
IN MECHANICAL ENGINEERING

SUBJECT	Scheduled hours per week		
	Lab'y or Drawing	Rec't'n or Lecture	Total No. Hours
FIRST TERM			
Thermodynamics and the Steam-Engine . . .	—	3	3
Valve-Gears	—	2	2
Heating and Ventilating	—	2	2
Electrical Machinery	—	3	3
Machine Designing and Drawing	6	2	8
Experimental Engineering	—	1	1
Mechanical Engineering Laboratory	6	—	6
Electrical Engineering Laboratory	3	—	3
Building Construction }	—	2	2
Business Methods	—	—	—
English, one hour bi-weekly	—	—	—
Engineering Seminary, bi-weekly	—	—	—
Visits of Inspection, monthly	—	—	—
	15	15	30
SECOND TERM			
Steam Machinery, Gas- and Oil-Engines, Me- chanical Refrigeration	—	4	4
Hydraulic and Pneumatic Machinery	—	2	2
Mechanical Engineering of Power-Plants	3	2	5
Design of Steam-Engine, and Special Machinery	6	2	8
Experimental Engineering	—	2	2
Mechanical Engineering Laboratory	6	—	6
Electrical Engineering Laboratory	3	—	3
English, one hour bi-weekly	—	—	—
Engineering Seminary, bi-weekly	—	—	—
Visits of Inspection, monthly	—	—	—
	18	12	30

REQUIREMENTS FOR ADMISSION

For admission to the School of Engineering, the applicant must have a knowledge of Mathematics through Plane Trigonometry; General Physics and Chemistry including Laboratory Work; Mechanical Drawing; and shop experience in working both wood and metal. He should have also the equivalent of a good high school education in the English branches. Graduates of the School of Mechanic Arts in the Institute are admitted on presentation of their diplomas.

No set examinations for admission are held. Eligibility is determined mainly on credentials, due account being taken of the maturity of the applicant and of any practical experience he may have had.

DIPLOMA

The Diploma of the Institute is granted to students who complete the full course and pass all the required examinations.

PREPARATORY COURSE

A Preparatory Course of one year is arranged for the student who, while having some knowledge of the subjects required for admission, is yet not fully qualified to enter the Engineering School. The work of the course is so planned that the student can make up his deficiencies. In it are included Mathematics, Science, Mechanical Drawing, Shopwork, and such English branches as may be required.

FEES AND TERMS

The fees are the same for both courses.

First term of each year, *thirty-eight dollars*; second term, *thirty-seven dollars*.

A deposit of *ten dollars* is required of every student, at the beginning of each year, to insure the Institute against loss through injury to the apparatus in the laboratories. This is returned at the close of the year, less the cost of the apparatus injured or destroyed. All the apparatus and materials used in the laboratories are supplied by the Institute.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

The students supply their own text-books and stationery.

CLASSROOMS AND LABORATORIES

The classrooms and laboratories of the School of Engineering are located in East Hall. The laboratories are on the ground floor of the building, the classrooms and drawing-rooms occupy the first floor. The engineering work is thus kept so closely related that a thorough correlation of the different branches is assured and the work of the students can be readily supervised.

The Classrooms are supplied with conveniences which adapt each one to the purposes for which it was planned. The Science Lecture-room is especially well-arranged. It is equipped with stereopticon lantern, gas, and electric connections with the laboratories.

The Engineering Drawing-room is a large, well-lighted

room, provided with desks, each of which has conveniently arranged drawers, under lock and key, for drawing materials, drawing-board, and the various hand-books, prints, and data relating to such designing work as the student may have in hand. A fine collection of blue-prints, photographs and drawings, hand books and catalogues, is available in connection with this department of work. All the calculating devices usually found in well-appointed commercial drawing-rooms are also provided.

The Headquarters Room of the School is arranged as a reading-room, and is supplied with the leading technical periodicals for ready reference by the students.

THE ELECTRICAL ENGINEERING LABORATORIES are all on the ground floor of the Institute buildings. They contain a complete equipment of modern electrical machinery and testing apparatus. The Dynamo Laboratories are in the Main Building, adjoining the boiler-room and the extensive electrical lighting plant of the Institute, from which they are, however, entirely separated. Opening from the Dynamo Laboratory on the one side is the Storage Battery Room, and on the other side is a passage leading to the Galvanometer and Photometer Laboratories.

A comprehensive system of switchboards and trunk lines makes it possible to supply direct or alternating dynamo current, or battery current, from different centres to any part of any of the laboratories.

The Dynamo Laboratory has its motive power supplied by a Porter-Allen seventy-five horse-power engine which drives a counter-shaft. Dynamos representing all the important types in use are driven from this shaft. There is a thirty K. W. 500-volt compound dynamo available for this

or any lower E. M. F.; a T. H. arc-dynamo; a 250 ampere 10-volt dynamo; several 110-volt dynamos. There are motors adapted to all the circuits which would be supplied from the different kinds of dynamos, including a pair of street-car motors arranged so that complete tests of them may be made. All the machines are of such size that commercial conditions are met by the student, without his encountering great difficulty in the making up of circuits or the handling of large currents through temporary connections. All necessary instruments for making measurements of dynamo current are found here. There are ammeters and voltmeters in great variety of range; speed-counters and stop-watches; rheostats and lamp-banks, etc. The arc-dynamo is connected with its own switchboard, and current is distributed through this to arc-lamps of various types. The arc-lamps in the laboratory include the most recent forms and makes. Current at 110-volts is derived as desired from the lighting plant of the Institute, but no current is sent to it from the laboratory. The students are put in charge of laboratory apparatus, so far as is practicable. A 15 K. W. 110-volt dynamo direct-connected to a double-vertical Armington & Sims high-speed engine gives an example of this type of machine. A 40 K. W. dynamo with full switchboard equipment, driven by a compound Westinghouse engine, is always available for dynamo tests.

The Alternating Current Laboratory contains a good equipment of representative apparatus. There are single and polyphase dynamos; dynamos for high and low frequency; induction and synchronous motors; a 10 K. W. rotary converter. At the Alternating Current switchboard

is a specially devised panel by means of which two- or three-phase current at 110- or 220-volts, as desired, is available from the same dynamo. There are many types and sizes of alternating current transformers and apparatus to illustrate special systems of arc and incandescent lighting. A motor drive is provided for the alternating current dynamos, so that their frequency may be more closely controlled. All instruments and apparatus required to make complete tests of these machines, as well as to perform many laboratory exercises, are part of the equipment.

The Storage Battery Laboratory contains sixty cells, showing the recent products of different makers. These are connected with a special switchboard, so that they can be used in any desired combinations. This laboratory is planned for various electro-chemical and electro-deposition work. In it are kept also various water- and water-cooled rheostats, since a continuous flow of water can there be maintained and a large amount of power be absorbed without inconvenience.

The Galvanometer Laboratories are arranged in a number of small rooms, in each of which two men only work at one time. Certain rooms are assigned to special purposes; for example, one to high-voltage tests of insulating materials; one to exact measurement of resistance; one to tests of magnetic permeability and general ballistic galvanometer work; one to standardizing ammeters, voltmeters, and wattmeters. The instrument room in the Galvanometer Laboratories is available for general electrical work, for such chemical work as desired, and as a centre from which primary battery current is distributed. In the various rooms are placed galvanometers, wheatstone bridges,

condensers, standards of electromotive-force, of resistance, of inductance, voltmeters, and many delicate and expensive appliances for accurate measurements. Located as the rooms of this laboratory are, all effects due to the proximity of large magnetic masses of iron and to vibration of the building or of machinery in motion are obviated.

Some special apparatus is installed for laboratory work, in connection with the class work given in Telegraphy and Telephony.

The Photometer Laboratory is arranged for the measurement of the candle-power of all the various modern types of electric lights, as well as for those using oil or gas. Most of the apparatus has been specially designed for this laboratory. It contains the best types of light standards known to modern science, and in it are used the best forms of cars and sight-boxes for light determinations. An illumination photometer has recently been added to this equipment.

THE MECHANICAL ENGINEERING LABORATORIES, like the Electrical Engineering Laboratories, are situated on the ground-floor of the Institute buildings. The rooms are large, well-lighted, of ready access from the class rooms and drawing-rooms, and each is devoted to a special division of the work.

The Steam Laboratory contains a fifty horse-power Wetherill-Corliss engine connected to a seventy-five horse-power Wheeler surface condenser and air-pump, and provided with Prony brake and all appliances for general work in indicator practice and engine-testing; a ten horse-power vertical throttling engine for first experiments in engine-running, valve-settings, clearance determinations, etc.; a

seventy-five horse-power Porter-Allen engine, belted to a line shaft in the Electrical Laboratory, thus readily providing it with dynamo loads; a twenty-five horse-power Armington & Sims double-vertical, direct-connected high-speed engine of the marine type; and a sixty horse-power Westinghouse compound engine. In addition to these a two hundred and fifty horse-power Ames automatic cut-off, a Harrisburg "Ideal" of fifty horse-power, and a Ball engine of ninety horse-power, in the Institute lighting plant, are available for a variety of experimental work. A battery of boilers provides means for making boiler tests and related experiments on an extended scale.

There are also a gas-engine of ten horse-power equipped for complete tests; several types of injectors; a De Laval steam-turbine of twenty-five horse-power, provided with separate sets of nozzles for condensing and non-condensing conditions; several types of steam-separators, steam-traps, automatic pressure-reducing and other special valves, illustrated both by examples in use and by sectioned models. Besides these, are the feed-water heaters, feed-pumps, and other auxiliaries about the power-plant, all of which are available for the purposes of laboratory investigation.

Among the engineering measuring instruments may be mentioned: Steam calorimeters—separating, throttling, and barrel; ten steam- and gas-engine indicators of different makes, including two high-temperature indicators with outside springs; tachometers and speed-counters; numerous steam- and water-pressure gauges of wide range; mercury and water manometers; a Green meteorological mercurial barometer; apparatus for the hot calibration of indicator springs; a Crosby gauge-testing

outfit; four planimeters of different types with calibration plates; a general assortment of steam thermometers ranging from 1000° F. down; platform scales of various capacities; besides other appliances.

The laboratory possesses also a complete equipment for the analysis of flue gases and the determination of the heating values of fuels, including an Ashcroft flue-gas pyrometer; a Chatalier thermo-electric pyrometer; the Fisher-Orsat and the Hempel forms of apparatus for gas analysis; apparatus for the proximate analysis of fuels; and an accurate fuel calorimeter.

The Laboratory for the Testing of Materials is equipped with an Olsen testing-machine of 200,000 pounds capacity, arranged for tensile, compressive, shearing, and transverse testing. It is provided with lateral and vertical extensions for the special testing of beams up to spans of twenty feet, and of columns up to a length of ten feet; a 60,000 inch-pound torsion testing-machine for shafting; a Thurston oil testing-machine with hydrometers, viscosimeters, and flash-point apparatus, for the testing of lubricating oils; a 2000-pound capacity Olsen cement testing-machine. Among other instruments may be mentioned a Henning extensometer, attachments for autographic stress-strain diagrams, and deflectometers for beams and columns.

The Hydraulic and Pneumatic Laboratory is provided with a Worthington duplex steam-pump; impact water-wheel; centrifugal pump; hydraulic ram; accumulators; tanks, weirs, water-meters, Pitots tube, hook-gauges, and other measuring apparatus; an air-compressor; a centrifugal fan; anemometers; manometers; pneumatic tools, and other appliances.

SUBJECTS OF INSTRUCTION

MATHEMATICS

The students begin at once the study of the calculus. The essentials of analytical geometry are given in connection with the first term's work, many of the formulæ being derived by the aid of the calculus. The differential and the integral calculus are carried along together, thus affording early application to a large class of practical problems. The student is thereby enabled to make early use of his mathematics as a valuable instrument in his engineering work.

PHYSICS

The work given to engineering students is of advanced character, both in class and laboratory. The topics treated are chosen with reference to their technical importance and their bearing on engineering work. The purpose is to give a better understanding of fundamental principles than that already obtained and their relation to each other, rather than a highly mathematical treatment of them. Special problems are discussed in order to place before the student possible sources of experimental error and the accuracy of final computed results.

In the laboratory the work is quantitative in its character. The student becomes familiar with the more delicate and precise instruments of the science as he uses them in making accurate measurements. So far as possible the methods of research are explained and investigation is encouraged.

CHEMISTRY

QUALITATIVE ANALYSIS.—The study of the reaction of the commoner metals is followed by the analysis of solutions containing them; of solutions containing bases and acids; and finally of powders, insoluble substances, alloys, and materials used in various branches of engineering work.

TECHNICAL CHEMISTRY.—The following investigations are made :

Fuel.—Proximate analysis of coal; moisture, volatile matter, coke, ash, and sulphur. Specific gravity and calorific value.

Gas.—Determinations of carbon di-oxide, carbon monoxide, hydrogen, and nitrogen. The Elliot, Fisher-Orsat, and Hempel forms of apparatus are used.

Water.—Total solid matter, temporary and permanent hardness, chlorides, sulphates, nitrates; also silica, iron oxide, alumina, lime, magnesia, potash, and soda.

Lubricating Oil.—Specific gravity; viscosity; cold test; flashing point; loss in weight on exposure to elevated temperature; tendency to oxidize and gum, percentage of mineral and of fatty oil, free fatty acid, free mineral acid, suspended matter, rosin oil.

APPLIED ELECTRO-CHEMISTRY.—The scope of this work is indicated by the following list of topics studied:

General Theory—refining of metals by electrolysis of aqueous solutions or of fused electrolytes. Production of alkali, chlorine, organic compounds, and many chemicals. Chemical products of the electric furnace; electro-deposition.

ENGLISH LANGUAGE

The purpose of this work is to cultivate in the engineering students the ability to write good English. To this end all written work is not only criticized for technical correctness, but is separately criticized and marked for English expression.

The proper forms in writing a report or in framing a specification are presented and exercises in such work are set. The students are familiarized also with good English as it is found in technical literature.

BUILDING CONSTRUCTION

Properties of building materials, including lime, cement, concrete, stone, brick, wood, etc. The use of these in foundations, walls, columns, floors, roofs.

Methods of fireproofing. Steel construction and the ordinary problems involved in it.

Information on important matters relating to plumbing, drainage, and ventilation is also given.

Problems relating to foundation work, columns, and floors are worked out by the students.

BUSINESS METHODS

The scope and purpose of this course are indicated by the schedule of topics. These are considered in detail:

Bank checks; promissory notes; partnerships; stock companies; investment securities; insurance; commercial credit; failure and assignments; contracts; principal and agent; patents.

ELECTRICAL ENGINEERING SUBJECTS

Electricity—General Theory.—Electrostatic principles; the electrostatic system of units; electrostatic induction; practical electrostatic apparatus. Permanent magnets; the magnetic field and its units; magnetic instruments; terrestrial magnetism. The principles and units of current electricity; Ohm's law; Joule's law; electrolysis; theory of primary and secondary batteries; commercial forms of batteries; electromagnetic induction; elementary theory of induction coils and dynamos; the electromagnetic system of units.

Electric Power Generation and Distribution.—Direct current dynamo types; characteristics; elementary features of windings and construction. Constant potential machines; constant current machines. Incandescent and arc lamps, with reference to typical forms and accepted methods of operating them. Direct current motor—types, performance, commercial applications. Direct current systems of distribution—constant potential, three wire, constant current. Line wires and wiring; the calculation of proper sizes. Switchboards. Dynamo connections for combined output.

Electro-Magnets.—The principles and units of the magnetic circuit. Applications of these in magnets designed for pulling, lifting, and signaling work. Magnetic leakage. Specific magnet designs for specified duty.

Dynamo Design.—General theory of direct current dynamos and motors with special reference to the effect of altered design on the result obtained. Armature windings and armature construction. Commutators, brushes, and theory of commutation. A complete dynamo or motor design. Special design features in arc dynamos, plating dynamos, boosters, dynamotors.

Alternating Currents.—The theory of periodic currents. Inductance and its effects in an alternating current circuit. Capacity and the effects produced by it. Methods of solving problems of the alternating current circuit. Methods of making experimental measurements. The alternating current dynamo; its armature winding, its excitation, its characteristics, its efficiency. Methods of operating into distributing circuits. Mutual inductance and transformer theory. Polyphase alternators, motors, and distributing systems. Polyphase motor theory, and practice. The designing of distributing systems. The planning of transformers, alternators, and alternating current motors.

Telephones and Telephone Systems.—The history and theory of the development of transmitters and receivers. Calling apparatus, hook-switches, induction coils. Central station systems which are much in use, with especial emphasis on common battery systems, and the switchboard devices used. Intercommunicating systems. Cables and lines.

Telegraph and Signal Systems.—All the common systems are studied, including the Morse, duplex, quadruplex, submarine, automatic, Marconi, district messenger, and fire-alarm telegraphs, in addition to railway block signal systems.

Each system is taken up in detail, and the working principles, the apparatus used and the adjustments necessary, the adaptability for particular service, with the limitations of each, are separately considered.

Electrical Measuring Instruments.—Methods of construction, use, adjustment, calibration, and repair of all kinds of galvanometers, shunts, resistances, condensers, ammeters, voltmeters, wattmeters, power-factor indicators, etc.

The application of these instruments to the testing of dynamo machinery; of distributing circuits for telegraph, telephone, light and power service; and of the various materials used in engineering work.

Electrical Engineering.—Cost of transmission and distribution of energy. Depreciation of electrical apparatus. Complete systems of distribution for lighting and for railway service. Traction problems. Storage-battery engineering. Lighting problems, including use of different methods, different arrangements, and the like. Estimates. Specifications.

Electrical Machinery.—A course dealing with the principles of electrical apparatus for both direct and alternating current, as these relate to features of operation; distributing systems and apparatus used on them; relative merits of different apparatus. A brief treatment of alternating current principles accompanies this work.

Electrical Drawing and Design.—This course consists of drawing-room work in making electrical diagrams, planned to teach the usual methods and conventions; exercises in simplifying complicated diagrams and in preparing simple diagrams to satisfy special conditions. Designs of house-wiring are worked out later, including switches, panel-boards, etc. Each student designs a rheostat for specific duty, a magnet, or a switchboard. The class makes a design for a dynamo or a motor and complete working drawings of it, also a piece of alternating current apparatus. This work is planned to come at times when the class work is most nearly related to it. It is found to have its highest value when given in this way.

Electric Engineering Laboratory.—This work is carried through both years of the course. The first work is elementary in character, with a view to initiating the student into the methods of connecting circuits, the making of measurements, and the use of common apparatus and instruments.

As the work advances, students make more comprehensive and important tests and operate more valuable machinery and apparatus. Throughout the course the laboratory work is arranged, so far as possible, with a view to familiarizing students with commercial methods and machines. The making of tests which have no practical bearing are omitted. When research work is undertaken it is only such as has an intimate relation to current engineering practice.

The principal lines of experimental work are as follows: the use of all kinds of instruments which are found in a commercial laboratory and their calibration; measurements of current, electromotive force, resistance, capacity; battery tests; insulation resistance measurements; conductivity and permeability determinations; accurate adjustment of resistance coils; silver and copper electrolysis for exact current measurement. Photometry of arc and incandescent lights; their efficiency; determinations of the value of light standards and candle-power of secondary standards.

Connecting, operating, and making tests upon the various types of direct current dynamos and motors to determine efficiency and capacity; setting brushes; winding armatures; finding trouble; repairing rheostats; wiring arc-lamps; operating dynamos in parallel.

Measurements in alternating current circuits, both single and polyphase, of power transformed, of inductance, of capacity. Transformer tests for regulation and efficiency. Connecting various sorts of distributing circuits and operating them. Alternator testing; synchronous and induction motor testing; rotary converter testing.

At least one project of design is carried through by the students each year, the constructive work being performed in laboratory periods.

The difference between the work done by the students in Electrical Engineering and that of the students in Mechanical Engineering lies mainly in the scope of work performed by each class. The students in Mechanical Engineering have less laboratory time, but are encouraged to cover as wide a range of experimental work as possible.

MECHANICAL ENGINEERING SUBJECTS

Mechanics of Materials.—The investigation of tensile, compressive, and shearing stresses in rods, beams, columns, and shafts; factors of safety; investigation and design of riveted joints; maximum allowable deflections in beams, columns, and shafts; continuous and restrained beams; stresses in shafts subject to both torsional and deflective forces, eccentric loading of columns, and other examples of combined stresses; temperature stresses; elasticity and resilience of materials; stresses due to impact and sudden loads;

stresses in ball and roller bearings; numerous applications to problems in the designing of machine parts and members of structures.

Principles of Mechanism.—The discussion of the principal forms of constrained motion; types of gearing, wheel-trains, and the essential form of wheel-teeth; parallel motions, universal joint, and other linkages; communication of motion by cams, pulleys, belts, and ropes; chain-gearing; aggregate combinations. Graphical problems in the designing of mechanisms.

Mechanics of Machinery.—The application of the fundamental principles of mechanics to the special consideration of the forces and motions occurring in machines; graphical analysis of stresses; diagrams of velocity and acceleration; stresses due to inertia; friction, power, and work; problems in the transmission of force and energy; calculation of stresses in machine members; dynamics of special machines and numerous applications to problems in machine design. This course accompanies the course in Machine Design and Drawing and serves to extend its range.

Materials of Engineering.—A brief course descriptive of the physical and chemical properties of the more common materials used in engineering work, to the end that the designer may be enabled to select the most suitable material for the individual members of a machine or structure. It consists of an outline of the metallurgy of iron and steel; the effect of slight variation in chemical composition upon the physical properties of the materials; the effect of mechanical treatment; the effect of heat treatment on the structure of steel-hardening, tempering, annealing; tool steels and cutting speeds; alloys of copper, zinc, and tin; bearing metals; cement; woods; rubber; character of stresses, factors of safety, and other considerations affecting the selection of material. This course is intended to supplement that in the Mechanics of Materials.

Machine Design and Drawing.—This course aims to afford practice in the actual designing of machinery. It begins with the application of the Principles of Mechanism and the Mechanics of Machinery to machine elements and power transmission devices and brings in such other considerations as are essential to good design. The designing of simple machines is then taken up, afterward the designing of larger and more complex machines. The course includes also designs, in whole or in part, of hoisting and conveying machinery, machine tools, steam machinery—boiler, engine, and auxiliaries—and power-plant installation. The larger problems are taken up by the class as a whole and the general design outlined, after which the remaining work is apportioned among the individual members, each student keeping in touch with the progress of the others.

A student wishing to specialize in a certain class of machinery has the opportunity, during the latter part of the course, of taking his problems in design from that class.

The machine design work is done mainly over the drawing board and is carried on as nearly as possible as in a regular engineering drawing-office. Special attention is given to the cultivation of habits of accuracy, completeness, and neatness in the making of working drawings, which are further required to be executed in accordance with the conventions and requirements of the best practice. Diagrams, tabulated data, trade catalogues, blue prints, and engineering reference books are freely used.

Steam-Boilers.—A descriptive study of the various types and makes of steam-generators in common use and the adaptability of each type to special work or localities ; the constituents of fuels and the intensity and quantity of heat evolved by their combustion ; natural and forced draft ; corrosion, incrustation, and other deteriorating influences and the means adopted for lessening them ; settings, furnaces, and chimneys ; the position of feed-inlet, blow-out valve and pipes, pressure-gauges, safety-valves, gauge-cocks, and other fittings, and the manner of attaching them to the boiler ; legal requirements and boiler inspection ; determination of grate surface, heating surface, and the relative efficiency of different portions of the latter in the evaporation of water ; strength of boilers ; staying and other details of construction ; accessories ; boiler-testing and boiler design. The study is accompanied by the actual testing of boilers in the Mechanical Engineering Laboratory and by the designing of a steam-boiler.

Mechanical Engineering Laboratory Work.—The work done in the laboratories is primarily intended to accompany and make practical application of the principles taught in the classroom and the lecture-room. The practical side of steam engineering is emphasized and, so far as possible, the duties of the stationary engineer are exemplified. The student is afforded also an opportunity to do some original work having direct bearing upon current engineering practice. Besides, the student is made familiar with the use and adjustment of the principal engineering measuring instruments, and incidentally is brought in close touch with a great variety of commercial appliances. Occasional tests are made of steam-engine and boiler performance in various plants in the city, also visits of inspection to neighboring manufacturing establishments and power-plants.

The following experiments, required of each student, will give some idea of the scope and character of the work : Calibration of the principal measuring instruments ; practice in the use of the principal makes of steam-engine indicators on a variety of engines, under different conditions, and with various kinds

of reducing motions ; interpretation of steam-engine, gas-engine, and pump-indicator diagrams with reference to valve adjustments ; setting the slide-valve and the Corliss valve by measurement and by indicator diagram ; measurements of moisture in steam ; computation from the diagram of weight of steam used in the engine, clearance, cylinder condensation, and reevaporation ; tests of the steam-injector ; flue-gas analysis, and determination of heat lost in the waste gases ; determination of the available heat in a fuel and the amount of moisture present ; engine tests with Prony brake, or dynamo load, and surface-condenser to determine steam consumption, thermal efficiency, mechanical efficiency ; tests of compound and triple expansion engines, and construction of combined indicator diagrams ; computation of heat losses by Him's method ; boiler trials and plant efficiencies.

Tests are made in the Strength of Materials Laboratory of the behavior of the principal materials of engineering when under stress. These include the determination, by experiment, of ultimate resistance, elastic limit, and ductility of the principal metals and woods in tension, compression, and shear ; the strength of cements in tension and compression ; the transverse strength and deflection of wooden beams and the common iron or steel structural shapes ; the torsional strength and deflection of shafting ; the strength of columns and the effect of eccentric loading ; resistance of brick and stone in compression ; impact tests on cast-iron. These experiments are made while the class is engaged in the study of the Mechanics of Materials and greatly assist in making that instruction thorough and concrete. Lubricants are tested for coefficient of friction, viscosity, flash- and chill-points, and for durability. Efficiency tests are made of transmission dynamometers, steam-pump, gas-engine, hydraulic ram, centrifugal pump, water-turbines, and steam-turbines. Tests of the strength and slippage of belts and of the power required by machine tools are also made. The course is concluded by a complete trial of a large power-plant or lighting station according to the revised codes of the American Society of Mechanical Engineers.

The difference in the work required of the students in Mechanical Engineering and of those in Electrical Engineering lies in the amount and scope. The students in Electrical Engineering have less assigned time in the Laboratory, but they are encouraged to cover as wide a range as possible.

Experimental Engineering.—This is a course of recitations and lectures designed to accompany and broaden the Mechanical Engineering Laboratory work. Other types of apparatus than those possessed by the Institute are described, different methods of testing and experiment are compared, and the results of the work already done in the Laboratory are discussed.

Thermodynamics and the Steam-Engine.—The general principles of

thermodynamics are taken up as an introduction to the more special study of the steam-engine, gas- and oil-engines, air-compressors, and mechanical refrigeration which follow. They include the consideration of work ; specific heat of a gas and vapor ; latent heat ; temperature ; equation of a gas ; the application of Boyle's law to the determination of the available work in a given quantity of a gas ; isothermal and adiabatic expansion lines ; curves of constant steam weight ; temperature-entropy diagrams ; the mechanical equivalent of heat ; comparison of the work actually obtained in a heat engine with that of an ideal engine working in Carnot's cycle.

The special study of the Steam-Engine immediately follows that of Thermodynamics and begins with the consideration of the peculiar properties of steam as an agent for the conversion of heat into mechanical energy. It includes initial condensation and the quality of the steam in the cylinder ; indicator diagrams ; economies effected by condensing, compounding, superheating, and by the steam-jacket ; jet- and surface-condensers ; feed-water heaters ; the injector ; air and circulating pumps ; the dynamics of the steam-engine ; the mechanical and the thermal efficiency of the steam-engine and engine-testing ; the various types of engines ; engine details ; engine foundations and bed-plates ; piping and attachments.

Steam Machinery, Gas- and Oil-Engines, and Mechanical Refrigeration. Steam Machinery includes steam-pumps, steam-turbines, hoisting engines, and the steam auxiliaries about a power plant. Gas- and Oil-Engines includes : the special thermodynamics of these engines ; description of the various types in use ; combustion and explosion ; ignition devices ; gas-engines giving an impulse at every revolution ; Otto-cycle engines ; gas- and oil-engine governors ; mechanical details ; the production of gas for motive power ; petroleum and paraffin oils ; economy of gas- and oil-engine ; difficulties of oil-engines ; gas- and oil-engine performance. Mechanical Refrigeration—the various systems, processes, and applications. Liquid air and other uses for the production of low temperature.

Valve-Gears.—The plain slide-valve gear and the relative motion of valve and piston are considered by both graphical and analytical methods. In connection with the graphical methods, the Zeuner, Bilgram, and Reuleaux diagrams are studied and the solution of problems relating to lap, lead, angle of advance, cut-off, release, and compression are effected thereby. Modifications of the plain slide-valve ; designing and setting valves ; automatic cut-off and expansion valve-gears ; shaft regulation ; the Stevenson link, Gouch motion, Joy, Meyer, Buckeye, Corliss, and other types of valve-gears. Special attention is given to the actual designs of these various types as found in different makes of engines.

Heating and Ventilating.—The practical application of the general laws of heat to the construction and operation of heating and ventilating apparatus. The course includes: the nature and properties of heat; principles of ventilation; quantity of heat required; heat given off by radiating surfaces; radiators, pipes, and fittings used in steam and hot-water heating; steam and hot-water boilers; methods of operating; systems of piping; heating with exhaust steam, hot air, and electricity; forced blast systems; cooling of rooms; automatic temperature regulators; the design of steam and hot-water systems; costs, specifications, and related business matters.

The Mechanical Engineering of Power-Plants.—The general consideration of the requirements and design of steam power-plants. Location and type of power-house; building, engine, boiler, and machinery foundations; selection of engines and boilers; specifications for same. Steam and water-piping, valves and fittings; pipe-coverings; specifications. Consideration of economies effected by use of condensers, feed water-heaters, economizers; the commercial forms and their selection. Fans and mechanical drafts *versus* chimney and natural draft. Chimney design. Coal and ash-handling machinery; coal-storage, water-supply; water purification; mechanical stokers. Cost of construction and operation. Design of a small power-plant or lighting-station.

Design of Steam-Engine and Special Machinery.—This course is a continuation of that in Machine Design and Drawing. It begins with the calculations and general considerations involved in the designing of steam-engines and is followed by their application in the actual designing of a particular engine to meet specified requirements. Each student makes all the important calculations and determinations, but the designing and drawing of details is apportioned among the several members of the class. These details are afterward used by each student in making assembled and sectional views of the complete engine.

The character of the work is indicated by the following: Determination of diagram of effective pressure on piston; of boiler pressure; of clearance, cut-off, and back pressure. Determination of ratio of length of connecting-rod to length of crank; of mean accelerating force required to start the reciprocating parts; diagrams of acceleration and of stresses due to the inertia of the reciprocating parts; construction of the diagram of resultant tangential pressures on the crank-pin; determination of diameter of cylinder, length of stroke, relative speed, and weight of reciprocating parts; preliminary estimate of dimensions of reciprocating parts; determination of weight of fly-wheel rim from tangential pressure diagram and allowable speed variation; calculations of the dimensions of the crank-disk and the crank-shaft;

length of main bearing, and determination of the plane of division of its brasses; the influence of the frictional resistances and the exact values of the forces of inertia on the balancing of the engine; calculation of the dimensions of steam ports, steam and exhaust pipes, thickness of cylinder walls; design of valve-gear; calculation of governor; design of engine details. The designing of special engines—gas, hydraulic, air, etc.—or of special machinery within the scope of previous study, each student working upon a different type of machine.

Hydraulic and Pneumatic Machinery.—The flow of water in pipes, through orifices, and over weirs. Work available from a given quantity and head of water; water-wheels; the different types of turbines with special reference to those used in dynamo driving; reaction and impulse wheels; centrifugal pumps and water-pressure engines; hydraulic presses; elevators and accumulators; method of regulating the flow through reaction wheels and loss in efficiency resulting from partial flow; hydraulic governors and their comparative value in connection with turbines driving electrical machinery.

The physical properties of air; flow under pressure through orifices; force due to motion. The thermodynamics of air machinery. The air-compressor; compressed air transmission devices; compressed air-motor; rock-drills and compressed air mining machinery; pneumatic tools and appliances; the pneumatic system of tube transmission. The properties of liquid air and its uses.

LIBRARY AND READING-ROOM

The Library of the Institute, which contains thirty-thousand volumes, is well supplied with works on the various subjects included in the course. Additions are constantly made of new books as they appear.

The Reading-room is supplied with the best home and foreign periodicals of art, science, technology, and literature, including the leading journals relating to electricity and allied subjects.

EVENING CLASSES

From the beginning of October until the end of March, the following evening courses in Engineering Subjects are offered :

ELECTRICAL ENGINEERING

APPLIED ELECTRICITY.

ENGINEERING ELECTRICITY.

TELEPHONY.

TELEGRAPHY.

DYNAMO DESIGN.

ALTERNATING CURRENT ENGINEERING.

ELECTRIC LIGHT ENGINEERING.

MECHANICAL ENGINEERING

STRENGTH OF MATERIALS AND APPLIED MECHANICS.

STEAM-ENGINE AND BOILERS.

DESIGN OF MACHINE ELEMENTS AND POWER TRANSMISSION DEVICES.

ADVANCED MACHINE DESIGN.

Full details concerning these courses will be found on page 213.

Circulars containing full information in regard to allied evening courses in Mechanical Drawing, Mathematics, Physics, Chemistry, and Machine-shop Work, can be had on application to the Registrar of the Institute.

SCHOOL OF MECHANIC ARTS

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

LIEUTENANT WILLIAM L. BAILIE (Engineer Corps, U. S. Navy),
Director, and Instructor in the Theory and Practice of the
Steam-Engine.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

WILLIAM J. HOPKINS, S. B.,
Professor of Physics.

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

THOMAS SMITH, B. S., M. E.,
Professor of Mechanical Drawing.

HOWARD H. DENN,
Instructor in Mechanical Drawing.

HARRIET L. MASON,
Professor of English Language and Literature.

ABRAHAM HENWOOD, B. S.,
Assistant Professor of Chemistry.

JOHN T. HOLDSWORTH,
Professor of Political Science.

KATHARINE D. BROWN, B. S.,
Instructor in Mathematics.

A. E. CHASE, B.A.,
Instructor in History.

_____,
Instructor in Mathematics.

- WILLIAM B. CREAGMILE,
Instructor in Electrical Engineering.
- STUART B. MOLONY,
Instructor in Physics.
- L. M. DALTON,
Instructor in English.
- J. PETERSON RYDER, S. B.,
Director of Physical Training.
- PRESCOTT A. HOPKINS, M. S.,
Lecturer on Architectural Styles.
- CLEMENT E. MOSSOP,
Instructor in Bench-Work and Machine-Work.
- R. WILLETTE CLINGER,
Instructor in Woodwork.
- THOMAS MC CREIGHT,
Instructor in Forging.

The School of Mechanic Arts provides a thorough course of instruction and training in mathematics, science, drawing, and shop-work, in connection with the essential English branches of a secondary education.

While the education given is intended to prepare for business or industrial pursuits, it seeks to develop and cultivate those qualities of mind and character that are of most value in the conduct of life. The object at every stage is to give the student the power to think and act for himself—the practical ability that is the best result of school training.

The whole course of instruction is so broad and yet so practical that the graduate is helped to determine the kind of work for which his taste and aptitude fit him; and at the same time he is prepared for such an advanced scientific or technical course as he may desire to pursue.

The School of Mechanic Arts prepares students for

admission to the technical courses in Electrical Engineering and Machine Construction and to the School of Architecture, in the Institute.

COURSE OF INSTRUCTION

JUNIOR YEAR

FIRST TERM

LANGUAGE.—Common figures of speech, punctuation, letter-writing. Reading of American classics.

MATHEMATICS.—Review of Arithmetic; the metric system of weights and measures. Algebra: to simple fractions, including the solution of some simple equations of the first degree.

DRAWING.—Mechanical, free-hand.

GENERAL HISTORY.—History of the civilization of Eastern nations. Greek history.

SHOP-WORK.—Woodwork: joinery. Ironwork: chipping and filing.

SECOND TERM.

LANGUAGE.—Composition. Biographical studies of American classics.

MATHEMATICS.—Algebra: continued to theory of exponents. Plane Geometry: the straight line.

DRAWING.—Mechanical, free-hand.

GENERAL HISTORY.—Roman and medieval history.

SHOP-WORK.—Woodwork: joinery. Ironwork: chipping and filing.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

MIDDLE YEAR.

FIRST TERM

LANGUAGE.—Sentences, diction, composition. Selected plays of Shakespeare.

MATHEMATICS.—Algebra : theory of exponents, radicals, quadratic equations, imaginaries. Plane Geometry : the circle, similar figures.

DRAWING.—Mechanical, free-hand. Descriptive Geometry.

SCIENCE.—General Chemistry—lectures, recitations, and laboratory work.

GENERAL HISTORY.—Modern European history.

SHOP-WORK.—Woodwork : turning. Pattern-making begun. Ironwork : forging begun.

SECOND TERM

LANGUAGE.—Grammatical principles, composition. English classics.

MATHEMATICS.—Plane Geometry completed. Solid Geometry. Algebra : proportion, variation, progression, use of logarithms.

DRAWING.—Mechanical, free-hand. Descriptive Geometry.

SCIENCE.—General Chemistry—lectures, recitations, and laboratory work.

UNITED STATES HISTORY.—Early American institutions and political history of the United States.

SHOP-WORK.—Woodwork : pattern-making finished. Metalwork : forging, molding, and founding.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

SENIOR YEAR

FIRST TERM

LANGUAGE.—Rhetorical principles, structure of the English language, essay-writing. English classics.

MATHEMATICS.—Algebra : binomial theorem, permutations, theorem of indeterminate coefficients, partial fractions, vanishing fractions. Plane Trigonometry, including the solution of right and oblique triangles. Special Trigonometry.

DRAWING.—Mechanical, architectural. Lectures on the architectural styles.

SCIENCE.—Outlines of general physics—lectures, recitations, and laboratory work.

ELEMENTARY POLITICAL SCIENCE.—Civics. Practical economics.

THEORY AND PRACTICE OF THE STEAM-ENGINE.

SHOP-WORK.—Machine-work.

BUILDING CONSTRUCTION AND TESTING-MACHINES.

SECOND TERM

LANGUAGE.—Essay-writing. Historical outlines of English and American literature. English classics.

MATHEMATICS.—Theoretical mechanics: elements of statics and dynamics. Plane surveying, with field work.

DRAWING.—Mechanical. Graphical statics. Architectural styles.

SCIENCE.—Outlines of general physics—lectures, recitations.

ELEMENTARY POLITICAL SCIENCE.—Comparative government. American political parties.

APPLIED ELECTRICITY.—The phenomena and simpler laws of electrostatics, magnetism, current electricity. The application of electrostatic and magnetic phenomena to useful purposes. Methods of current distribution and descriptions of their application to lighting, power, etc. Electrical laboratory work.

THEORY AND PRACTICE OF THE STEAM-ENGINE.

SHOP-WORK.—Machine-work.

BUSINESS CORRESPONDENCE.

PUBLIC SPEAKING, once a week throughout the year.

The following tables give the distribution of time for the several subjects of instruction :

JUNIOR YEAR

Subject	No. of hours per week	
	1st Term	2d Term
English Language	3	3
Mathematics	5	5
Mechanical Drawing	6	6
Free-hand Drawing	2	2
General History	2	2
Shop-Work in Wood—Joinery	5	5
Shop-Work in Iron—Bench-Work	5	5
Gymnasium	2	2
	30	30

MIDDLE YEAR

Subject	No. of hours per week	
	1st Term	2d Term
English Language and Literature	2	2
Mathematics	5	5
Mechanical Drawing	4	4
Descriptive Geometry	1	1
Free-hand Drawing	1	1
Chemistry—Lectures and Laboratory	5	5
General History	2	2
Shop-Work in Wood—Turning, Pattern-Working	4	4
Shop-Work in Iron—Forging	4	4
Gymnasium	2	2
	30	30

SENIOR YEAR

Subject	No. of hours per week.	
	1st Term	2d Term
English Language and Literature	2	2
Mathematics	5	5
Mechanical Drawing	5	5
Physics II., Lectures	2	2
Physics IV., Laboratory	4	4
Elementary Political Science	2	2
Steam-Engine	1	1
Shop-Work—Machine-Shop	5	5
Building Construction and Testing-Machines	2	—
Graphical Statics	—	2
Architectural Styles—Lectures	1	—
Business Correspondence	—	1
Public Speaking	1	1
	30	30

Students attend five days a week, from 9 a. m. to 4 p. m.

The time of the student is about equally divided between the classroom and laboratory studies and the shop-work.

The scientific instruction is given chiefly by lectures and laboratory work, the text-book being used only for reference and review.

The English instruction, which is carried throughout the entire course, is thorough and comprehensive and furnishes a basis of sound liberal culture for all the other studies.

The practical instruction given in the shops affords a valuable aid to the scientific studies. It brings the student into direct and intimate relation with natural forces, where a practical application of these studies is required. A good

knowledge is imparted of the technical apparatus involved in the mechanic arts, which becomes of practical value as a means of general training, besides affording the best kind of preparation for advanced education in mechanical and electrical engineering.

The Institute reserves the right to retain drawings and products of the workshops, made by students.

Visits are made by the students, accompanied by the professors, from time to time, to the chief industrial establishments of the city and neighborhood.

DIPLOMA

A diploma is granted to students who complete the course and pass all the required examinations.

SPECIAL COURSES

Special courses can be arranged to suit the individual needs of students who are fitted to pursue them advantageously.

LABORATORIES AND WORKSHOPS

The chemical and physical laboratories are large, well-lighted, well-ventilated rooms, and are supplied with extensive collections of apparatus and with every appliance for the work done by the students.

The technical shops for woodwork, bench-work, machine-work, and forging are unsurpassed in the completeness and perfection of their appointments.

The electrical laboratories are finely-appointed rooms and are provided with a Corliss thirty-horse-power engine, a Porter-Allen seventy-five-horse-power engine, an Arming-

ton-Sims twenty-horse-power marine engine, dynamos of the most recent design, storage batteries, and all the necessary apparatus and appliances for practical instruction in electrical science and its applications.

The extensive mechanical and electrical plant of the Institute building is also made available in the technical instruction.

GYMNASIUM

The Gymnasium is a large, airy room, completely equipped in accordance with the requirements of the Swedish system of physical training and with dressing-rooms, and bath-rooms supplied with hot and cold water. All the training is conducted under the immediate supervision of the Director.

LIBRARY AND MUSEUM

In connection with the work of the department, constant use is made of the Library, which contains thirty thousand volumes, and of the Museum of the Institute. The students have the use also of the Reading-room, which is well supplied with the best home and foreign periodicals relating to art, science, technology, and literature.

ADMISSION

Students must have at least a good elementary education. The examination for admission includes English grammar and composition, arithmetic, geography, and United States history. Advanced standing can be taken by students possessing the requisite qualifications. Entrance examinations are held at the beginning of June and September.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

First term of each year, *thirty-eight dollars* ; second term, *thirty-seven dollars*.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

The fees include all materials and tools used in the chemical, physical, and electrical laboratories and the workshops. Students are responsible, however, for their own breakage in the laboratories and workshops. A deposit of *fifty cents* is required the first year, as security for the return of the locker key. A deposit of *five dollars* is required at the beginning of the second and the third year, which is returned at the close of the year, less the cost of the apparatus destroyed.

The training in the Gymnasium, use of baths, etc., is included in the fee.

Students supply their own text-books and drawing instruments.

There are two terms in the year beginning, respectively, in September and February.

COURSE IN MECHANICAL DRAWING

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

THOMAS SMITH, B. S., M. E.,
Professor of Mechanical Drawing, in charge.

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

WILLIAM J. HOPKINS, S. B.,
Professor of Physics.

HOWARD H. DENN,
Instructor in Mechanical Drawing.

KATHARINE D. BROWN, B. S.,
Instructor in Mathematics.

STUART B. MOLONY,
Instructor in Physics.

Instructor in Mathematics.

CLEMENT E. MOSSOP,
Instructor in Ironwork and Machine Construction.

R. WILLETTE CLINGER,
Instructor in Woodwork and Pattern-making.

THOMAS MCCREIGHT,
Instructor in Forging.

J. PETERSON RYDER, S. B.,
Director of Physical Training.

The Course in Mechanical Drawing is intended for the training of mechanical draftsmen. The instruction is com-

prehensive and thorough and aims to qualify young men for the successful prosecution of an occupation in which there is a constant demand for well-trained workers. The course extends through two years, each year being divided into two terms. More than half of the student's time is devoted to mechanical drawing.

COURSE OF INSTRUCTION

JUNIOR YEAR

FIRST TERM

DRAWING.—Mechanical: the use of instruments; lines and measurements; orthographic projection as far as the intersection and development of pyramids. Free-hand drawing. Exercises in lettering.

MATHEMATICS.—Review of Arithmetic, giving special attention to decimals, ratio and proportion, percentage, square root; metric system, practical measurements. Elementary Algebra through simple fractional equations of one unknown quantity.

SHOP-WORK.—Bench-work in iron. Students complete the elementary exercises during this term.

SECOND TERM

DRAWING.—Mechanical: intersections completed; the cycloid, epicycloid, hypocycloid, and involute curves; their application to spur and bevel-gear drawing. Free-hand drawing. Exercises in lettering. Line shading.

MATHEMATICS.—Algebra through quadratics; theory of exponents and radicals. Practical Geometry.

SHOP-WORK.—Elementary exercises in woodwork. Bench-work in iron. During this term the student completes some project which has been designed in the drawing-room, including key-fitting and scraping a cylindrical surface to a bearing.

SENIOR YEAR

FIRST TERM

MECHANICAL DRAWING.—Worm-gears, sketching from machines, making assembled drawings from sketches and working drawings, and machine designs. Descriptive Geometry. Exercises in lettering.

MATHEMATICS.—Essentials of Plane Trigonometry, including drill in use of logarithmic tables and solution of right and oblique triangles. Practical Geometry and Mensuration of surfaces and solids.

PHYSICS.—Laboratory work, consisting of manipulation and measurements.

SHOP-WORK.—Woodwork: pattern-making. Forging, machine-work: parts of a machine designed in the drawing-room.

THEORY AND PRACTICE OF THE STEAM ENGINE.

SECOND TERM

MECHANICAL DRAWING.—Work from sketches: complete drawings; the designing of a machine to be constructed in the machine-shop. Descriptive Geometry. Graphic statics. Exercises in lettering.

MATHEMATICS.—Elementary Mechanics. Elements of Plane Surveying and Leveling—recitation and field-work.

PHYSICS.—Laboratory work, consisting of manipulation and measurements.

SHOP-WORK.—Woodwork : pattern-making. Machine-work : worm, worm-wheel, and gear-cutting.

THEORY AND PRACTICE OF THE STEAM-ENGINE.

CERTIFICATE

A certificate is given to students who complete the course of instruction and pass the required examinations.

SPECIAL COURSES

Special courses can be arranged to suit the needs of individual students.

The drawing-rooms, workshops, and physical laboratory are unsurpassed in the completeness and perfection of their appointments.

Students attend five days a week, from 9 a. m. to 4 p. m.

The Institute reserves the right to retain drawings and products of the workshops, made by students.

ADMISSION

Applicants must have at least a good elementary education. An entrance examination in arithmetic is required.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

The fee for the course is *twenty-five dollars* per term.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

The fee includes all materials and tools used in the

physical laboratory and the workshops. Students are responsible, however, for their own breakage in the laboratories and workshops. A deposit of *five dollars* is required at the beginning of the second year, which is returned at the close of the year, less the cost of the apparatus destroyed.

The training in the Gymnasium, use of baths, etc., is included in the fee.

Students supply their own text-books and drawing instruments.

There are two terms in the year, beginning, respectively, in September and February.

EVENING CLASSES

From the first of October until the end of March, courses of instruction in Mechanical Drawing, Mathematics, Physics, Shop-work, and Machine Construction are open to students in the evening. Full details will be found on page 226.

COURSE IN MACHINE CONSTRUCTION

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

LIEUTENANT WILLIAM L. BAILIE, U. S. N., Director,
Lecturer on the Theory and Practice of the Steam-Engine.

WILLIAM J. HOPKINS, S. B.,
Professor of Physics.

THOMAS SMITH, B. S., M. E.,
Professor of Mechanical Drawing.

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

KATHARINE D. BROWN, B. S.,
Instructor in Mathematics.

HOWARD H. DENN,
Instructor in Mechanical Drawing.

STUART B. MOLONY,
Instructor in Physics.

_____,
Instructor in Mathematics.

CLEMENT E. MOSSOP,
Instructor in Bench-Work and Machine Construction.

R. WILLETTE CLINGER,
Instructor in Woodwork and Pattern-making.

THOMAS MCCREIGHT,
Instructor in Forging.

J. PETERSON RYDER, S. B.,
Director of Physical Training.

The course in Machine Construction provides instruction in the theory of machinery, and practical training in the designing and construction of machines. It is especially adapted to young men who wish to prepare themselves for positions of responsibility in mechanical establishments. It gives them a practical working knowledge of shop-work, mathematics, mechanical drawing, and physics, as applied to the designing and construction of machinery. It also offers to those who cannot take an advanced technical course the opportunity of fitting themselves in two years for occupations in which advancement depends upon a knowledge of general scientific principles as well as upon the technical skill derived from thorough systematic training in the workshop.

COURSE OF INSTRUCTION

The course of instruction occupies two years.

JUNIOR YEAR

FIRST TERM

SHOP-WORK.—Bench-work in iron. Students complete the elementary exercises during this term.

MECHANICAL DRAWING.—The use of instruments; orthographic projection as far as the intersection and development of prisms. Exercises in lettering.

MATHEMATICS.—Review of Arithmetic, giving special attention to decimals, ratio and proportion, percentage, square root, metric system, practical measurements. Elementary Algebra through simple fractional equations of one unknown quantity.

SECOND TERM

SHOP-WORK.—Elementary exercises in woodwork. Bench-work in iron. During this term the student completes some project which has been designed in the drawing-room, and unless the realization of the project includes key-fitting, special instruction is given in the same.

MECHANICAL DRAWING.—Intersections completed. The cycloid, epicycloid, hypocycloid, and involute curves; their application to spurs and bevel gears. Logarithmic and Archimedean spirals and their application to cams. Exercises in lettering.

MATHEMATICS.—Algebra through quadratics; theory of exponents and radicals. Practical Geometry.

PHYSICAL TRAINING in the Gymnasium, twice a week during the year.

SENIOR YEAR**FIRST TERM**

SHOP-WORK.—Woodwork: pattern-making. Forging. Machine-work both in operating and constructing.

MECHANICAL DRAWING.—Line shading. Sketching from machines; making assembled drawings of machines from sketches. Worm and worm-gears. Exercises in lettering. Descriptive Geometry.

MATHEMATICS.—Essentials of Plane Trigonometry, including drill in use of logarithmic tables and solution of right and oblique triangles. Practical Geometry and Mensuration of surfaces and solids.

PHYSICS.—Laboratory work consisting of manipulation and measurements.

THEORY AND PRACTICE OF THE STEAM-ENGINE.

SECOND TERM

SHOP-WORK.—Woodwork: pattern-making. Machine-work: assembling; worm and gear work.

MECHANICAL DRAWING.—Problems in the construction of machines. Graphic statics. Descriptive Geometry. Exercises in lettering.

MATHEMATICS.—Elementary Mechanics. Elements of Plane Surveying and Leveling—recitation and field-work.

PHYSICS.—Laboratory work consisting of manipulation and measurements.

THEORY AND PRACTICE OF THE STEAM-ENGINE.

PHYSICAL TRAINING in the Gymnasium, twice a week, during the year.

CERTIFICATE

A certificate is granted to students who complete the course of instruction and pass all the required examinations.

SPECIAL COURSES

Special courses can be arranged to suit the needs of individual students.

ATTENDANCE

Students attend five days a week, from 9 a. m. to 4 p. m.

The time is so divided that the knowledge acquired in the classrooms is graphically illustrated by the work in the shops.

EQUIPMENT

The machine-shop is a large and finely-appointed room and is furnished with the following machines from the best

makers in the country—Brown & Sharpe ; Bement, Miles & Co. ; and William Sellers & Co. : four thirteen-inch lathes, one sixteen-inch lathe, one twenty-one-inch lathe, one No. 4 universal milling machine, one mandril grinder, one six-inch slotter, one twenty-five-inch planer, one sixteen-inch vertical drill, one Dwight No. 4 sensitive drill, one six-inch and three thirteen-inch screw-cutting lathes. In addition to these, there are now in use in the machine-shop, the following tools which have been designed and built by the students of the Institute : three thirteen-inch screw-cutting lathes, one six-inch screw-cutting lathe, one ten-inch shaper, one motor for driving tool-grinder, one motor for driving circular saw, two sensitive drill presses, one hydraulic mandril press, two ten-inch chuck lathes, one wet and dry emery grinder, one twelve-horse-power compound marine engine. The motive power of the machine-shop is supplied by three five-horse-power electric motors, designed and built by the students.

The technical shops for woodwork, bench-work, and forging are unsurpassed in the completeness and perfection of their appointments.

The physical laboratories are supplied with extensive collections of apparatus and with every appliance necessary for the work to be done by the students.

ADMISSION

For admission to the regular course, applicants must have a good elementary education. An entrance examination in arithmetic is required.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

The fee is *twenty-five dollars* per term.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

The fee includes all materials and tools used in the chemical, physical, and electrical laboratories, and the workshops. Students are responsible, however, for their own breakage in the laboratories and workshops. A deposit of *five dollars* is required at the beginning of the year, which is returned at its close, less the cost of the apparatus destroyed.

The training in the Gymnasium, use of baths, etc., is included in the fee.

Students supply their own text-books, paper, and drawing instruments.

The Institute reserves the right to retain drawings and products of the workshops, made by students.

There are two terms in the year, beginning, respectively, in September and February.

EVENING CLASSES

From the first of October until the end of March, a course of instruction, covering nearly the same ground as the regular course, is open to students in the evening. Full details will be found on page 227.

COURSES IN MATHEMATICS

INSTRUCTORS

- CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.
- KATHARINE D. BROWN, B. S.,
Instructor in Mathematics.
- LEROY A. HOWLAND, B. A.,
Instructor in Mathematics.
-

COURSES OF INSTRUCTION

ALGEBRA

- I. Algebra to simple fractions, including the solution of some simple equations of the first degree. Five hours a week throughout the first term of each year.
- II. Algebra continued to the theory of exponents. Three hours a week throughout the second term of each year.
- III. Theory of exponents, radicals, quadratic equations, imaginaries. Three hours a week throughout the first term of each year.
- IV. Proportion, the progressions, variation, use of logarithms. One hour a week throughout the second term of each year.
- V. Binomial theorem, permutations, indeterminate coefficients, partial fractions, vanishing fractions. Two hours a week throughout the first term of each year.

- VI. Elementary course in the essentials of Algebra through quadratics, running throughout the year. Five hours a week the first term, two hours the second term. Required of students in Architecture, Machine Construction, and Mechanical Drawing.

GEOMETRY

- I. Plane Geometry—the straight line. Two hours a week throughout the second term of each year.
- II. Plane Geometry—the circle, similar figures. Two hours a week throughout the first term of each year.
- III. Plane Geometry completed; Solid Geometry. Four hours a week throughout the second term of each year.
- IV. Analytical Geometry. Four hours a week throughout the first term of each year.
- V. Practical Geometry—an elementary course in concrete geometry and mensuration, as a preparation for a study of first steps in trigonometry. Beginning the second term of each year and continuing two terms. Two hours a week.

TRIGONOMETRY

- I. Plane and Spherical Trigonometry, including the solution of right and oblique triangles, and simple practical problems in Geography, Astronomy, and Navigation. Three hours a week throughout the first term of each year.
- II. A short elementary course in the essentials of Plane Trigonometry, sufficient to prepare for Mechanics II. and Surveying II. Two hours a week throughout the second half of the first term of each year.

MECHANICS

- I.** A course in the elements of Theoretical Mechanics, treating of statics and dynamics. The work embraces the following subjects :

Statics.—Composition and resolution of forces, moments, couples, equilibrium of a rigid body under the action of three forces, friction, and work.

Dynamics.—Laws of motion, motion of a body under the action of gravity, impulse, work, energy, uniform motion in a circle, projectiles. Two hours a week throughout the second term of each year.

This course requires previous knowledge of Algebra I. and II., Geometry I., II. and III., Trigonometry I.

- II.** A more elementary course in Theoretical Mechanics, for students who have taken Algebra V., Geometry V., and Trigonometry II. Two hours a week throughout the second term of each year.

SURVEYING

- I.** An elementary course in land surveying, direct leveling, topographical surveying, map drawing, preliminary railroad surveying. Recitation and field work. This course, running two hours a week throughout the second term of each year, requires a thorough knowledge of Algebra III., Geometry III., Trigonometry I.
- II.** An elementary course in land surveying and direct leveling. Recitation and field work. Two hours a week throughout the second term of each year.

CALCULUS

- I. The elements of the differential Calculus, introducing at an early period the integration of some simple forms, with the solution of practical problems in geometry and mechanics. Four hours a week throughout the second term of each year.
- II. Continuation of Course I., taking up the treatment of more advanced subjects in both the differential and integral calculus, such as imaginaries, hyperbolic functions, curve tracing, methods of integration, rectification and areas of plane curves, volumes of solids, centre of gravity. Four hours a week throughout the first term of each year.

All the above courses are required of students in Electrical Engineering. The courses in Analytical Geometry and Calculus are not required of students in Mechanic Arts, Machine Construction, and Mechanical Drawing.

CERTIFICATE

Certificates are granted to students who complete all the courses and pass the required examinations in the same.

REQUIREMENTS FOR ADMISSION

A knowledge of Arithmetic is required for admission to Course I. in Algebra. For admission to the other courses, a satisfactory examination must be passed in all the work of the previous courses.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4. p. m., or by letter.

FEES AND TERMS

Ten dollars per term for any two of the courses. The fee is the same for one course.

Students supply their own text books and stationery.

There are two terms in the year, beginning, respectively, in September and February.

EVENING CLASSES

The above courses are offered also during the evening session, with some modifications, full information concerning which will be found on page 209.

COURSES IN PHYSICS

INSTRUCTORS

WILLIAM J. HOPKINS, S. B.,
Professor of Physics.

STUART B. MOLONY,
Instructor in Physics.

COURSES OF INSTRUCTION

- I. PREPARATORY COURSE.**
- II. GENERAL PHYSICS.**
- III. GENERAL LABORATORY COURSE.**
- IV. ELEMENTS OF THE PRINCIPLES OF MEASUREMENT.**
- V. ADVANCED LABORATORY COURSE.**
- VI. ACOUSTICS AND OPTICS.**

I. PREPARATORY COURSE

Four hours a week through the first term, or two hours a week throughout the year.

This is a laboratory course, designed primarily to train the student in habits of accurate observation and careful

manipulation, and to familiarize him with laboratory methods. As a preparation for more advanced work it is of the greatest value.

These purposes, it is thought, are best accomplished by a series of experiments covering rather fully one branch of the science and involving quantitative measurement. The subject of mechanics has been selected for the most extended treatment, inasmuch as it is the foundation of all subsequent work. The experiments may be performed with simple apparatus.

The course consists of about twenty exercises to be performed independently by each student. The instructions are sufficiently explicit to enable the student to work intelligently, and he receives, in addition, as much personal attention from the instructor as is necessary.

The requirements for admission to this course are as follows : Algebra, through quadratics ; Plane Geometry.

II. GENERAL PHYSICS

Two lectures a week throughout the year.

The lectures cover thoroughly the general subject of Physics, giving a broad and simple treatment of each branch, with the applications to practice. The first term is devoted to a thorough descriptive treatment of the mechanics of solids and fluids, with problems of a practical and useful nature. In the second term, heat, light, sound, and the elements of magnetism and electricity are given similar treatment.

The requirements for admission to this course are, as follows : Algebra, including quadratics, proportion ; Loga-

rithms (Algebra III.); Plane and Solid Geometry (Geometry III.).

III. GENERAL LABORATORY COURSE

Four hours a week through the second term.

The work in this course is a study of methods of measurement, involving the use of the standard instruments of precision. It consists of training and practice in the use of such instruments, and in the determination, by established methods, of values of quantities already well-known.

The requirements for admission to this course are as follows: Preparatory Physics (Course I. above); Algebra, including quadratics, proportion; Logarithms (Algebra III.); Plane and Solid Geometry (Geometry III.).

IV. ELEMENTS OF THE PRINCIPLES OF MEASUREMENT

Two lectures a week through the first term.

The systems of measurement are first developed from the laws of motion, and the units derived. Methods of measurement are then reviewed, with especial reference to questions of precision, and the theory of the precision of measurements is treated in a simple manner. The remainder of the course is occupied with the application of these principles to specific problems: both those met in the course of the work in the laboratory and others of a kind likely to arise in practice.

The requirements for admission to this course are, as follows: General Physics (Course II. above); General Laboratory Course (Course III. above); Advanced Algebra (Algebra IV.); Plane Trigonometry (Trig. I.).

V. ADVANCED LABORATORY COURSE

Three hours a week through the first term.

In this course the student is trained in more advanced work and in methods of research and extends his knowledge of instruments. Toward the end of the course each student undertakes a brief original investigation, occupying several weeks, upon a topic assigned by the instructor.

The requirements for admission to this course are, as follows: General Laboratory Course (Course III. above); General Physics (Course II. above); Advanced Algebra (Algebra IV.); Plane Trigonometry (Trig. I.).

VI. ACOUSTICS AND OPTICS

Two lectures a week through one term.

The requirements for admission to this course are, as follows: Physics II.; Physics III.; Algebra IV.; Trigonometry I.

SPECIAL COURSES

In addition to the regular courses offered, special courses may be arranged for those students desiring to devote more than the allotted time to the subject, or for students desiring to pursue special lines of work beyond that laid down in the regular courses.

Opportunity is offered for advanced work in experimental physics, to those competent to pursue such work.

The attention of teachers and of those intending to become teachers is particularly called to the opportunities offered for qualifying themselves for advanced work in their profession. Every possible endeavor will be made to

arrange the work and the time to suit the individual needs of such persons.

CERTIFICATE

Certificates are granted to students who complete the first four courses and pass the required examinations.

EQUIPMENT

The Lecture-room is furnished with every convenience for scientific experiments. The laboratories are supplied with extensive collections of modern apparatus by the best makers, and are fully equipped with all the appointments needed for experimental work.

ADMISSION

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Preparatory Course, *ten dollars* per term.

General Physics and General Laboratory Course, *fifteen dollars* per term.

Acoustics and Optics, *ten dollars* per term.

Elements of the Principles of Measurement and Advanced Laboratory Course, *fifteen dollars* per term.

For Special Courses, the fee corresponds to the amount of work undertaken.

A deposit of *five dollars* to cover breakage in the laboratories, is required of each student. This is returned at the close of the year, less the cost of the apparatus injured.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

Students supply their own text-books and stationery.

There are two terms in the year, beginning, respectively, in September and February.

EVENING CLASSES

Courses in General Physics are given during the winter months, full information concerning which will be found on page 210.

COURSES IN CHEMISTRY

INSTRUCTORS

- ERNEST ARNOLD CONGDON, Ph. B.,
Professor of Chemistry.
- ABRAHAM HENWOOD, B. S.,
Assistant Professor of Chemistry.
- ROLAND W. WHITE,
Laboratory Assistant.
-

COURSES OF INSTRUCTION

- I. GENERAL CHEMISTRY.
- II. QUALITATIVE ANALYSIS.
- III. QUANTITATIVE ANALYSIS.
- IV. ORGANIC CHEMISTRY.
- V. LECTURES ON THE CHEMISTRY OF FOODS AND
DIETETICS.
- VI. LECTURES ON TEXTILES, DYEING, AND CLEANSING.
- VII. APPLIED ELECTRO-CHEMISTRY.
- VIII. SPECIAL COURSES.

I. GENERAL CHEMISTRY

A course of lectures and laboratory work extending through one year, with oral and written examinations. Two lectures, two laboratory periods, and one recitation per week.

The lectures are fully illustrated by experiments, charts and diagrams, specimens, and lantern views.

The instruction is made thorough and practical by constant personal supervision in the laboratories.

The student is trained to obtain by induction the more important principles of the science, to study the comparative properties of substances, and particularly to acquire a scientific habit of thought. Many problems are introduced throughout the course.

Notes are taken by the students at the lectures and in the laboratory, and complete records of their laboratory work, including descriptions and sketches, are kept in books which are examined weekly.

II. QUALITATIVE ANALYSIS

This course extends through one year, and consists of lectures and laboratory work, with frequent oral, and occasional written, examinations. One lecture and one laboratory period per week.

The student first studies the reaction of the more common metals. After this preliminary work, he analyzes solutions containing the metals, beginning with the separate groups of metals, and afterwards analyzing solutions containing all the metals studied.

In like manner the acids are next studied. The student then proceeds to analyze solutions that may contain all of the bases and acids studied; after which, general miscellaneous qualitative work is taken up, such as the examination of powders, insoluble substances, alloys, and such special work as time permits.

III. QUANTITATIVE ANALYSIS

There are three courses in Quantitative Analysis.

A. GENERAL COURSE

The instruction extends over two years, and consists of lectures, recitations, and laboratory work. The laboratory work aims to be thorough and sufficiently comprehensive, including pure salts, minerals and ores, alloys, water, gas, and technical products.

The lectures and recitations cover the methods used for the determination and separation of the common elements in their various forms of combination. A thorough drill in stoichiometric problems is also made an important feature of the work.

The laboratory work is individual in its character—the progress of the student depending upon his ability and industry.

B. TECHNICAL ANALYSIS

This course is designed to meet the needs of engineering students. It is limited in its scope, embracing only what are regarded as essentials.

Fuel.—Proximate analysis of coal; moisture, volatile matter, coke, ash, and sulphur. Specific gravity and calorific value.

Gas.—Flue and illuminating gas, employing the Elliot, Fisher-Orsat, and Hempel forms of apparatus.

Water.—Determination of hardness, and quantities of correcting materials required.

Lubricating Oil.—Specific gravity, viscosity, cold test, flashing point, loss in weight on exposure to elevated temperatures, percentage of mineral and fatty oil, free acid, suspended matters.

One laboratory period and one recitation per week throughout the term.

C. FOOD ANALYSIS

Practical laboratory experience with the processes in present use for the analysis of food materials is made the basis of the instruction.

The laboratory work is of such a character as to furnish data for the calculation of food values as well as to detect adulterations.

The following list indicates the general scope of the quantitative work : chemically pure salts; potable water; common salt; bicarbonate of sodium; flour or bread; baking-powders; sugar or syrups; milk; butter; lard; cheese; tea; coffee; chocolate.

IV. ORGANIC CHEMISTRY

The Chemistry of Hydrocarbons and their derivatives.

The course embraces lectures and laboratory work with frequent oral, and occasional written, examinations. One lecture and two laboratory periods per week.

The lectures are based upon a printed syllabus, prepared especially for the use of students.

V. LECTURES ON THE CHEMISTRY OF FOODS AND DIETETICS

A course of twelve lectures.

In this course the subject is treated, so far as possible, from the chemical standpoint. The chemical composition and relationship of substances used as foods are explained, as well as the changes brought about by the application of heat (as in cooking), and also changes produced by other means, such as vital forces, fermentation, and the general chemical reactions of bodies.

The following subjects are included in the lectures :

Definitions of foods—chemical composition of food materials and of the human body; proximate food principles—protein, fat, carbohydrates, water, mineral matter; value of foods; use of calories; nutrient ratio; metabolism of foods; diet and dietaries; food materials—water (potable and mineral), common salt, starch foods, sugars, fats, and oils, cereals, meats, eggs, fish, fruits, vegetables, salads, beverages, food adjuncts; study of fermentation; preparation of food materials; changes that foods undergo in cooking processes.

A syllabus of the course has been prepared for the use of students.

VI. LECTURES ON TEXTILES, DYEING, AND CLEANSING

This course includes a brief historical sketch of the use of textiles and the art of dyeing.

This is followed by a description of the more important textiles—cotton, flax, ramie, wool, and silk—and of the microscopical and chemical methods of distinguishing between them.

The materials used in dyeing and the operations preliminary to it, and the chemistry of washing, cleansing, bleaching, and dyeing are explained.

Some account is given of the natural and artificial coloring matters, and of the chemistry of the coal-tar colors, which completes the course.

VII. APPLIED ELECTRO-CHEMISTRY

This course is designed for Electrical Engineers and students of Technical Chemistry. Instruction is given by means of lectures, recitations, and problems in design of apparatus and processes.

Its scope is indicated by the following list of topics :

General Principles and Theory.

Refining of Metals by Electrolysis of Aqueous Solutions.

Refining of Metals by Electrolysis of Fused Electrolytes.

Electric Furnace.

Electro-Deposition.

Alkali, Chlorine, etc.

Organic Compounds and other Chemicals.

Efficiency of Methods.

Blount's "Practical Electro-Chemistry" is the guide employed.

VIII. SPECIAL COURSES

In addition to the regular courses offered, special courses may be arranged for those students desiring to devote more than the allotted time to the subject, or for students desiring to pursue special lines of work beyond that laid down in the regular courses.

Opportunity is offered for advanced work in experimental chemistry, to those competent to pursue such work.

The attention of teachers and of those intending to become teachers is particularly called to the opportunities offered for qualifying themselves for advanced work in their profession. Every possible endeavor will be made to arrange the work and the time to suit the individual needs of such persons.

CERTIFICATE

Certificates are granted to students who complete

Courses I, II, III, and IV, and pass the required examinations in the same.

LABORATORIES

The Laboratories are large and well-appointed rooms. The General Laboratory has accommodations for one hundred and seventy students. The ventilation is excellent—a most important feature and one that bears directly on the comfort and health of the students. The special features of the laboratory are : the placing of the sinks upon the desks, so that every four students use the same sink ; the fume closets or hoods, which are perfectly arranged and, by means of an artificial draft, carry off all noxious vapors and acid fumes ; the shelving on each desk holding the reagent bottles, arranged in such a manner as not to interfere with the supply of light.

The Quantitative Laboratory, which has accommodations for sixty students, is equally well-appointed.

REQUIREMENTS FOR ADMISSION

No previous knowledge of Chemistry is required for admission to the General Course, but a knowledge of the metric system is essential.

For admission to the Second Course, students must have completed the General Course or its equivalent.

The Third and Fourth Courses may be taken in order by students who have completed the first two courses or their equivalents.

A knowledge of General Chemistry is required for admission to the lectures on the Chemistry of Foods.

No special preparation is required for admission to the Lectures on Textiles, Dyeing, and Cleansing.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Courses in General Chemistry, Qualitative Analysis, Quantitative Analysis, and Organic Chemistry, each *twelve dollars* per term.

For the courses of lectures in the Chemistry of Foods and in Textiles, Dyeing, and Cleansing, each *two dollars*.

Students supply their own text-books and stationery.

Common chemicals used in the laboratory are supplied to the students free of charge.

A deposit of *five dollars*, to cover breakage of apparatus, is required of each student taking the laboratory work. This is returned at the close of the year, less the cost of the apparatus destroyed.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

There are two terms in the year, beginning, respectively, in September and February.

EVENING CLASSES

Courses in Elementary and Advanced Chemistry, with laboratory work, are given from the beginning of October until the end of March. Full details will be found on page 211.

DEPARTMENT OF COMMERCE AND FINANCE

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

PARKE SCHOCH, A. M., Director,
Professor of the History and Mechanism of Commerce, and
Stenography.

CHARLES D. CLARKSON,
Professor of the Theory and Practice of Accounts.

CARL LEWIS ALTMAIER,
Professor of Commercial Law and Instructor in Correspondence
and Typewriting.

JOHN T. HOLDSWORTH,
Professor of Commercial Geography and Banking.

WILLIAM G. HAIMES,
Professor of Spanish.

CAROLYN H. LOCKE,
Instructor in Stenography.

ALICE ELIZABETH CHASE, B. A.,
Instructor in English.

LILLIAN M. DALTON,
Instructor in English.

MAUDE G. HOPKINS,
J. PETERSON RYDER, S. B.,
Directors of Physical Training.

The Department of Commerce and Finance is founded on a broad and liberal basis. In its general features it resembles the commercial schools of Europe and is intended

to place commercial education in its proper relation to other departments of educational work. The object of the course is to train young men to do business rather than simply to record business. The field of business will never be wholly occupied. It will always offer large privilege and rich reward to the right kind of ability. No other field presents larger inducements or implies greater responsibilities ; no other field draws more largely upon the ranks of able and ambitious young men. Modern business has grown so complex and its requirements are so exacting that a knowledge of its laws, customs, and tendencies is necessary, not only to success, but to a comfortable existence. Every successful man is, in a sense, a successful business man.

The department has been organized with the view of meeting these conditions. It provides a liberal, and, at the same time, thoroughly practical course of study, including two years' training in a knowledge of the world's industries and their markets, the laws of trade and finance, and the mechanism and customs of business.

Our growing commercial relations with Spanish speaking countries, especially Cuba, Puerto Rico, the Philippines, and the South American Republics, make it desirable that a knowledge of Spanish should form a part of the equipment of every young man entering commercial life. To meet these new conditions, the Spanish language, specially adapted to the needs of business, is given a place in the scheme of instruction.

Besides the systematic course of two years, there are three distinct Office Courses, each occupying one year and leading directly to a specific line of employment. A course is offered for teachers who wish to fit themselves for commercial high-school work.

COURSES OF INSTRUCTION

The Department is organized, as follows :

- I. SCHOOL OF COMMERCE AND ACCOUNTS.
- II. COMMERCIAL COURSE FOR TEACHERS.
- III. OFFICE COURSES.
- IV. EVENING COURSES.

I. SCHOOL OF COMMERCE AND ACCOUNTS

The aim of the School of Commerce and Accounts is to give young men and young women thorough fundamental training for the activities of business which include : (1) The production, manufacture, sale, and transportation of articles of commerce ; (2) the management of stock companies and corporations ; (3) the buying and selling of securities ; (4) the importing and exporting of merchandise ; (5) the borrowing and lending of money and credit ; (6) the advertising of commercial concerns ; (7) the keeping of business records ; (8) a knowledge of the Spanish language.

The work of the course is divided into two years, as follows :

JUNIOR YEAR

FIRST TERM

ENGLISH LANGUAGE.—Composition ; letter-writing. American classics.

COMMERCIAL ARITHMETIC.—Weights and measures ; metric system ; trade standards and prices ; wages and pay-rolls ; commercial interest and discount ; speed practice.

BUSINESS CUSTOMS.—Invoices ; commercial paper ; bills of lading and manifests ; vouchers.

BOOKKEEPING.—Principles and practice of single and double entry ; simple transactions ; business forms.

PENMANSHIP.—A plain, rapid business hand.

TYPEWRITING.—Word exercises ; study of mechanism of machine ; transcribing from rough draft.

CORRESPONDENCE.—Mechanical arrangement and style of business letter ; exercises in condensing and expanding.

COMMERCIAL GEOGRAPHY.—Physical and mathematical geography in their relations to commerce. Commercial geography of the United States.

SPANISH LANGUAGE.—Elementary grammar, oral and written exercises ; vocabulary.

SECOND TERM

ENGLISH LANGUAGE.—Grammatical principles ; diction. Selected classics.

INDUSTRIAL ARITHMETIC.—Measurements ; builders' and contractors' bids and estimates ; scientific measurements ; manufacturers' and mechanics' estimates ; metric system.

BUSINESS CUSTOMS.—Securities ; collections ; discounts.

BOOKKEEPING.—Principles and practice of single and double entry in more complicated transactions. Shipments, consignments, and business forms.

COMMERCIAL CALCULATIONS.—Practical exercises for acquiring rapidity and accuracy of work.

COMMERCIAL GEOGRAPHY.—Industrial and economic geography of the United States, special attention being given to the new dependencies. Study of the world's commercial staples, raw and manufactured.

SPANISH LANGUAGE.—Grammar, oral and written exercises, vocabulary, reading ; business letters and business forms.

PENMANSHIP.—Continued.

TYPEWRITING.—Continued.

CORRESPONDENCE.—Letters relating to contracts, purchases and sales, recommendations, introduction, credit ; circulars, telegrams.

PUBLIC SPEAKING.—One hour a week, throughout the year.

PHYSICAL TRAINING in the Gymnasium, twice a week, throughout the year.

SENIOR YEAR

FIRST TERM

ENGLISH LANGUAGE.—Rhetorical principles; synonyms; essay-writing.

ADVANCED BOOKKEEPING.—Importing and jobbing ; wholesale and retail ; manufacturing, real estate, joint-stock companies, corporations, banking, etc. Introducing order-book, cash-book, invoice and sales register, special-column journal, bill-book.

BANKING AND FINANCE.—Outlines of the history of banking and of the National banking system, state banks, savings-banks, trust and financial companies ; foreign banking ; banking in its relations to foreign trade.

COMMERCIAL ARITHMETIC.—Financial problems involving partial payments ; buying and selling exchanges ; stocks and bonds ; equating of accounts ; adjusting of partnership, joint-stock company, and corporation accounts.

COMMERCIAL GEOGRAPHY.—A comparative study of the commerce and industry of the great commercial nations of the world.

HISTORY OF COMMERCE.—Outlines of the history of ancient, medieval, and modern commerce, with special reference to the history of American commerce.

CIVICS.—Principles and practical operation of government in the United States.

SPANISH LANGUAGE.—Grammar, conversation, reading, correspondence..

TYPEWRITING.—Arrangement of papers.

SECOND TERM

ENGLISH LANGUAGE.—Paragraph—its sum and structure.
Study of selected plays of Shakespeare.

ADVANCED BOOKKEEPING.—Continued.

COMMERCIAL ARITHMETIC.—Continued.

BANKING AND FINANCE.—Bank management, mechanism and practice of banking ; the clearing-house ; currency reform.

COMMERCIAL GEOGRAPHY.—Continued. Special studies requiring independent research.

MECHANISM OF COMMERCE.—Boards of trade ; stock and produce exchanges ; transportation ; interstate commerce ; warehousing ; importing and exporting ; duties ; exchange ; mercantile agencies.

COMMERCIAL LAW.—Elementary principles of contracts and negotiable paper, and the leading principles which regulate the relations of the business man—principal and agent; carriers; commission merchants; partnerships; joint-stock companies; corporations.

CIVICS.—Principles and practical operation of government in the United States; history, principles, and organization of political parties; civil service; ballot systems; representation systems; municipal government.

BUSINESS PRINTING AND ADVERTISING.—Type and paper; printers' estimates; proof-reading; business cards, circulars, and catalogues. Modern advertising, including mediums, rates, agencies.

SPANISH LANGUAGE.—Reading, conversation, correspondence.

PUBLIC SPEAKING.—One hour a week, throughout the year.

PHYSICAL TRAINING in the Gymnasium, twice a week, throughout the year.

There are evening classes in the Spanish, French, and German languages, to which students of the department may be admitted on the payment of a fee of *six dollars* for each language.

Students may elect to do special work in chemistry, at the discretion of the Director in charge.

The stereopticon is freely used in the classroom, as an aid in teaching the history and mechanism of commerce, commercial geography, and other subjects.

During the Senior Year, visits are made to some of the leading industrial and commercial establishments of Philadelphia, and systematic use is made of the Philadelphia Commercial Museums in the study of commercial geography.

Table showing the distribution of time for the several subjects of instruction.

JUNIOR YEAR

SUBJECT	No. of hours per week
English Language	2
Commercial and Industrial Arithmetic	4
Business Customs	1
Bookkeeping	5
Penmanship	2
Typewriting	2
Correspondence	1
Commercial Geography	2
Spanish Language	2
Public Speaking	1
Physical Training	2
Total	24

SENIOR YEAR

SUBJECT	No. of hours per week	
	1st Term	2d Term
English Language	2	2
Bookkeeping	3	3
Banking and Finance	1	1
Commercial Arithmetic	3	3
Commercial Geography	2	2
History of Commerce	2	—
Mechanism of Commerce	—	2
Civics	2	2
Spanish Language	2	2
Commercial Law	—	2
Business Printing and Advertising	—	1 ¹
Typewriting	2	—
Public Speaking	1	1
Physical Training	2	2
Total	22	23

¹ Part of the term.

DIPLOMA

The diploma of the Institute is granted to students who complete the work of the School of Commerce and Accounts and pass the prescribed examinations.

II. COMMERCIAL COURSE FOR TEACHERS

In order to meet the growing demand for specially trained commercial teachers, the Institute offers instruction to men and women who wish to equip themselves for entrance upon the new and widening field of commercial work in high schools and academies.

For admission to this course, the applicant must have had at least two years' experience in general teaching, or must have been graduated from a state normal school of approved standing.

Students who enter this course are given special consideration by the professors and instructors of the department, generous assistance being given in methods of teaching, the preparation of outlines and courses, and the bibliography of the several subjects.

The Institute, in its complete reference libraries, its Museum, its courses of free public lectures and concerts, and its various departments of educational work, offers superior advantages to the student looking to teaching as a profession.

The course occupies one year, divided into two terms, and includes the following subjects :

ENGLISH LANGUAGE.—Rhetorical principles ; essay-writing.
Selected plays of Shakespeare.

BOOKKEEPING.—Principles and practice of single and double entry ; business forms ; importing and jobbing ; wholesale and retail ; manufacturing, real-estate, joint-stock companies ; corporations ; banking, etc. Introducing order-book, cash-book, invoice and sales register, special-column journal, bill-book.

COMMERCIAL ARITHMETIC.—Financial problems involving partial payments ; buying and selling exchanges ; stocks and bonds ; equating of accounts ; adjusting of partnership, joint-stock company, and corporation accounts.

BANKING AND FINANCE.—Outlines of the history of banking and of the national banking system, state banks, savings banks, trust and financial companies ; foreign banking ; banking in its relations to foreign trade ; bank management, mechanism and practice of banking ; the clearing house ; currency reform.

COMMERCIAL GEOGRAPHY.—Physical and mathematical geography in their relations to commerce. Industrial, commercial, and economic geography of the United States. Comparative study of the commerce and industry of the great commercial nations of the world. Special studies requiring independent research.

HISTORY OF COMMERCE.—Outlines of the history of ancient, medieval, and modern commerce, with special reference to the history of American commerce.

COMMERCIAL LAW.—Elementary principles of contracts and negotiable paper, and the leading principles which regulate the relations of the business man—principal and agent ; carriers ; commission merchants ; partnerships ; joint-stock companies ; corporations.

MECHANISM OF COMMERCE.—Boards of trade ; stock and produce exchanges ; transportation ; interstate com-

merce ; warehousing ; importing and exporting ; duties ; exchange ; mercantile agencies.

CIVICS.—Principles and practical operation of government in the United States ; history, principles, and organization of political parties ; civil service ; ballot systems ; representation systems ; municipal government.

STENOGRAPHY.—Theory of Pitman System. Special emphasis upon methods of teaching the subject.

TYPEWRITING.—Word exercises ; study of leading typewriters ; transcribing from rough draft ; arrangement of papers. Instruction in duplicating processes ; letterpress ; office practice.

PENMANSHIP.—A plain, rapid business hand.

Should the student's time admit, the Spanish language may be added to the course.

Table of the distribution of time for the several subjects of instruction.

Subject	Hours per week	
	1st Term	2d Term
Bookkeeping	3	3
Commercial Arithmetic	3	3
Commercial Geography	3	3
History of Commerce	2	0
Banking and Finance	1	1
English Language	2	2
Civics	2	2
Stenography	3	3
Typewriting	3	3
Commercial Law	0	2
Mechanism of Commerce	0	2
Penmanship	1	1
	23	25

DIPLOMA

The diploma of the Institute is granted to students who complete the Commercial Course for Teachers, and prepare an acceptable thesis upon an assigned commercial topic.

III. OFFICE COURSES

Three distinct Office Courses are offered. These are thoroughly practical in character, and are adapted to prepare young men and young women for entering immediately upon the respective lines of employment to which the training leads.

SECRETARY COURSE

This course has been organized to respond to applications that are made to the Institute for clerks fitted to do work of a more general character and of a higher grade than that required in a purely business office. Applicants for admission must show by examination, or otherwise, that they are prepared to profit by the training given in this course.

The course occupies one year, divided into two terms, and includes the following subjects :

STENOGRAPHY.—*First Term*—Theory of Pitman System: daily drill in phonetics. *Second Term*—Practice of the art by means of carefully graded dictation exercises, and daily transcript of notes.

TYPEWRITING.—Word exercises; study of leading typewriters; transcribing from rough draft; arrangement of papers. Instruction in duplicating processes; letterpress; office practice.

ENGLISH LANGUAGE.—Rhetorical principles; essay-writing; collection and arrangement of material; criticism of manuscript. English classics.

SPANISH LANGUAGE.—Grammar, oral and written exercises; reading, correspondence, business letters and business forms.

BUSINESS PRINTING.—Type and paper; printers' estimates; proof-reading.

ACCOUNTS, BUSINESS FORMS AND CUSTOMS.—Elements of single and double entry bookkeeping; invoices, commercial paper, vouchers, etc.

CORRESPONDENCE.—Arrangement and style of business letters; letters of recommendation, introduction, etc.; circulars, telegrams.

PENMANSHIP.

PUBLIC SPEAKING.—One hour a week, for young men.

PHYSICAL TRAINING in the Gymnasium, twice a week.

Table of the distribution of time for the several subjects of instruction:

SUBJECT	No. of hours per week.
Stenography	9
Typewriting	5
English Language	2
Spanish Language	2
Accounts, Business Forms and Customs	1
Correspondence	1
Penmanship	1
Business Printing	1 ¹
Physical Training	2
Total	24

¹ Part of second term.

BOOKKEEPING COURSE

The object of this course is to prepare young men and young women for positions as bookkeepers. It occupies one year, divided into two terms, and includes the following subjects :

BOOKKEEPING.—Single and double entry; use of auxiliary books; order-books, cash-books, invoice and sales register, bill-book, special-column journal, etc.

COMMERCIAL ARITHMETIC.—Weights, measures; metric system; builders', manufacturers', mechanics' estimates; partial payments; exchanges, stocks, bonds, partnerships; joint-stock companies and corporations; speed practice.

BUSINESS FORMS AND CUSTOMS.—Invoices, commercial paper, bills of lading and manifests; vouchers.

ENGLISH LANGUAGE.—Composition; letter-writing; grammatical principles. American classics.

CORRESPONDENCE.—Arrangement and style of business letters; letters of recommendation, introduction, etc.; circulars, telegrams.

PENMANSHIP.—A plain, rapid business hand.

TYPEWRITING.—Word exercise; mechanism of machine; transcribing from rough drafts; arrangement of papers.

PUBLIC SPEAKING.—One hour a week, for young men.

PHYSICAL TRAINING.—In the Gymnasium, twice a week.

Table of the distribution of time for the several subjects of instruction:

Subject	No of hours per week
Bookkeeping	8
Commercial and Industrial Arithmetic	5
Business Forms and Customs	1
English Language	2
Correspondence	1
Penmanship	2
Typewriting	3
Public Speaking	1
Physical Training	2
Total	25

STENOGRAPHY COURSE

The aim of this course is to train young men and young women for positions as stenographers. There is a growing demand among business men for stenographers who can not only take down and typewrite correspondence, but who have a serviceable knowledge of good English and who are intelligently trained along general educational lines.

The course occupies one year, divided into two terms, and includes the following subjects :

STENOGRAPHY.—*First Term*—Theory of Pitman System; daily drill in phonetics. *Second Term*—Practice of the art by means of carefully graded dictation exercises, and daily transcript of notes.

TYPEWRITING.—Word exercises; study of leading typewriters; transcribing from rough draft; arrangement of papers. Instruction in duplicating processes; letterpress; office practice.

ENGLISH LANGUAGE.—Composition ; letter-writing ; grammatical principles. Selected American or English poets.

ACCOUNTS, BUSINESS FORMS AND CUSTOMS.—Elements of single and double entry bookkeeping; invoices, commercial paper, vouchers, etc.

CORRESPONDENCE.—Practice in writing business letters, orders, and telegrams.

PENMANSHIP.

PUBLIC SPEAKING.—One hour a week, for young men.

PHYSICAL TRAINING in the Gymnasium, twice a week.

Table of the distribution of time for the several subjects of instruction.

Subject	No. of hours per week
Stenography	9
Typewriting	5
English	2
Accounts, Business Forms and Customs	1
Correspondence	1
Penmanship	1
Physical Training	2
Total	21

CERTIFICATES

Certificates are granted to students who complete any one of the Office Courses and pass the prescribed examinations.

GYMNASIUM

The Gymnasium is a large, airy room, completely equipped in accordance with the requirements of the Swedish system of physical training and with dressing-rooms, and bath-rooms supplied with hot and cold water. All the training is conducted under the immediate supervision of the Directors.

COMMERCIAL MUSEUM

A beginning was made in 1895 towards the formation of a permanent Commercial Museum, and a large collection of raw and manufactured products has already been secured. The collection represents quite fully the following industrial products: Flour; wool; petroleum; teas and coffees; sugar; cotton; copper; iron and steel; glass; tobacco; leather; rubber; paper; wood; carpet; linen; spices; aluminum; building stone; brick and terra-cotta. Additions are constantly being made, and the student who is looking forward to devoting his life to trade, shipping, or manufacturing, has opportunity, in connection with his academic work, to make a special study, from both a geographic and an economic standpoint, of the particular industry in which he is interested.

ART MUSEUM

The Art Museum contains extensive collections representing the industrial arts of Egypt, India, China, Japan, and Europe.

LIBRARY

The Library, which contains thirty thousand volumes, is supplied with books, periodicals, and pamphlets bearing upon the work of the department, and every facility and assistance is afforded for the study of financial, economic, and commercial questions.

ADMISSION

Applicants for admission to any of the courses, except the Commercial Course for Teachers, must pass satisfactory examinations in English Grammar and Composition, Geography, Arithmetic, and United States History.

For admission to the School of Commerce and Accounts, or to any of the Office Courses, candidates must be at least sixteen years of age.

The diploma of high schools of approved standing is accepted in place of an examination.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

School of Commerce and Accounts, *twenty-five dollars* per term.

Commercial Course for Teachers, *thirty dollars* per term.

Office Courses, *twenty-five dollars* per term, each.

Students provide their own text-books and stationery.

Coat-lockers, with individual combination locks, are provided for the men students, giving to each the absolute control of his own property. Each student is charged *fifty cents* per term for a locker.

A deposit of *one dollar* is required of each student for necessary keys. This deposit is refunded at the end of the year, on return of the keys.

There are two terms in the year, beginning, respectively, in September and February. New classes are formed only in September. Five days' attendance a week, from 9 a. m. until 3 p. m., is required for all courses except the Stenography Course, which closes at 2 p. m.

EVENING COURSES

The Department of Evening Classes is fully organized, and includes the following courses in commercial instruction :

1. A Systematic Course in Bookkeeping, Commercial Arithmetic, and Penmanship.
2. Office Course in Stenography and Typewriting.

Fee for each of the courses, for the entire session of six months, *five dollars*.

Full details will be found on page 228.

DEPARTMENT OF DOMESTIC SCIENCE

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

HELEN M. SPRING, Director,
Instructor in Household Science and Economics.

ALBERT P. BRUBAKER, M. D.,
Professor of Anatomy and Physiology.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

HARRIET L. MASON,
Professor of English Language and Literature.

ABRAHAM HENWOOD, B. S.,
Assistant Professor of Chemistry.

MARGARET C. LIMERICK,
Instructor in Cookery.

HARRIET P. MITCHELL,
Instructor in Bacteriology and Cookery.

KATHARINE MCCOLLIN,
Instructor in Cookery.

Instructor in Invalid Cookery.

MAUDE G. HOPKINS,
Director of Physical Training.

JOHN T. HOLDSWORTH,
Professor of Business Customs and Accounts.

PRESCOTT A. HOPKINS, M. S.,
Lecturer on Domestic Architecture.

PRESIDENT MAC ALISTER lectures on The History and Institutes of Education, during the Senior Year.

COURSES IN COOKERY AND HOUSEHOLD ECONOMICS

The following courses in Cookery and other subjects connected with the household are offered :

- I. GENERAL COOKERY.
- II. INVALID COOKERY.
- III. HOUSEKEEPERS COURSE.
- IV. HOME NURSING.
- V. COURSE FOR WAITRESSES.
- VI. COURSE IN LAUNDRY WORK.
- VII. CHILDREN'S SATURDAY MORNING CLASS.
- VIII. THE PLANNING AND BUILDING OF THE HOUSE.
- IX. EVENING CLASSES IN GENERAL COOKERY.

I. GENERAL COOKERY

There are three courses in General Cookery. Each course occupies one term and is complete in itself. The three courses are consecutive and must be taken up in regular order.

FIRST COURSE.—Instruction in the composition and dietetic value of food materials. The lessons are arranged in logical order, and each principle is illustrated by the preparation of simple dishes. The instruction is largely individual, each student preparing an entire dish. The object of the course is the preparation of food in the most digestible and appetizing forms.

SECOND COURSE.—Instruction and practice of an advanced character in the preparation of more complicated dishes and menus than are included in the First Course.

THIRD COURSE.—This course includes the preparation of still more elaborate and expensive dishes ; lessons on marketing and carving ; practical demonstration in the cutting of meat.

These courses present the scientific, hygienic, and sanitary features of the household in such a manner as will prove of practical benefit to women who manage their own homes. It supplies the kind of information needed by young women preparing themselves for household duties and responsibilities.

In each course, one lesson, of three hours, is given weekly.

II. INVALID COOKERY

The course is intended for professional nurses and other persons desirous of acquiring a practical knowledge of cookery suitable for the sick-room. The course extends through one term, with one lesson, of two and one-half hours, each week. A carefully prepared syllabus is made the basis of the instruction.

Classes of medical students desirous of taking the course can receive instruction in the afternoon or evening.

III. HOUSEKEEPERS COURSE

This course is offered in the belief that greater skill and intelligence are needed in the management of the home, and for the purpose of providing thorough training for women possessing the requisite qualifications to fit themselves for positions as housekeepers or as matrons of public institutions. The course occupies one year. It embraces the following subjects : The General Courses in Cookery ; the Course in Invalid Cookery ; Course in Lunch-room Cookery ; Course for Waitresses ; the Course in Laundry Work ; Marketing ; Lectures on Physiology and Hygiene ; Home Nursing ; Familiar Talks on Food Materials and other matters relating to the Household ; Business Forms and Accounts.

IV. HOME NURSING

The furnishing, warming, and ventilating of the sick-room ; bathing, dressing, and administering food and medicine to patients ; practical bandaging ; bed-making ; lifting and caring for helpless patients ; preparation and application of poultices. The training is carried on in a furnished bed-room.

V. COURSE FOR WAITRESSES

A course of six lessons, including the following subjects in which every well-trained waitress should be expert : Care of dining-room and pantry ; care of silver and cutlery ; serving of breakfast, luncheon, and dinner ; washing dishes ; washing and ironing table-linen ; removal of stains.

The classes meet in the afternoon or evening. Each lesson occupies two hours.

VI. LAUNDRY WORK

Practice in washing and ironing fabrics and articles of various kinds. Instruction is given in the scientific principles of laundry work as well as practical training in the laundry. This course is intended for students taking the Normal Course, and as a special course when classes of sufficient size are formed.

VII. CHILDREN'S SATURDAY MORNING CLASS

A class for young girls unable to attend on the other days of the week.

The instruction is especially adapted to girls between twelve and eighteen years of age. The class meets on Saturday morning, at ten o'clock. Each lesson occupies two hours.

VIII. THE PLANNING AND BUILDING OF THE HOUSE

During the second term a course of lectures on this subject is given by Professor Prescott A. Hopkins ; it is open to students taking Courses I. and III.

ADMISSION

Application for admission to any of the courses must be approved by the Director.

Applicants for admission to the Housekeepers Course must have a good general education and be at least twenty-five years of age.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

The fees for the several courses, per term, including all materials, are as follows :

First Course in General Cookery, *ten dollars.*

Second Course in General Cookery, *fifteen dollars.*

Third Course in General Cookery, *eighteen dollars.*

Invalid Cookery, *ten dollars.* Classes of Nurses from Hospitals and of Medical Students, *six dollars.*

Housekeepers Course, *twenty-five dollars.*

Home Nursing, *five dollars.*

Course for Waitresses, *three dollars.*

Laundry Work, *three dollars.*

Children's Saturday Morning Class, *eight dollars.*

There are two terms in the year, beginning, respectively, in October and February.

EVENING CLASSES

In the Evening Classes, instruction is given in the first two courses of General Cookery and in the Course for Waitresses, and is similar to that of the day classes.

The session extends through six months, from the beginning of October to the end of March. In each course, one lesson, of two hours, is given weekly.

Fees for the entire session, which include the cost of all the materials used in the instruction: First Course, *five dollars*; Second Course, *six dollars*; Course for Waitresses, *three dollars*.

Full details will be found on page 234.

NORMAL COURSE IN DOMESTIC SCIENCE

The Normal Course in Domestic Science is designed for those who wish to become directors or instructors in this department of educational work in public or private schools, colleges, or hospitals. The course of instruction and training is comprehensive and liberal. The importance of domestic science in its economic and social relations is daily becoming more fully recognized, and the demand for teachers possessing the requisite qualifications is constantly increasing. The instruction is thoroughly scientific and practical, and its bearings upon domestic life are kept in view throughout the course.

The course occupies two years and embraces the following subjects:

JUNIOR YEAR

FIRST TERM

HOUSEHOLD SCIENCE AND ECONOMICS.—First Course in Theoretical and Practical Cookery. Course for Waitresses. Lectures on special topics.

CHEMISTRY.—General Chemistry—lectures and laboratory work.

ANATOMY AND PHYSIOLOGY.—Lectures and demonstrations.

OBSERVATION OF TEACHING in cookery classes in public schools.

BUSINESS CUSTOMS AND ACCOUNTS.

PHYSICAL TRAINING.—Systematic practice in the Gymnasium.

SECOND TERM

HOUSEHOLD SCIENCE AND ECONOMICS.—Second Course in Theoretical and Practical Cookery. Invalid Cookery. Combination of dishes for meals. Marketing. Laundry work. Lectures on special topics.

CHEMISTRY.—General chemistry—lectures and laboratory work. Qualitative analysis.

ANATOMY AND PHYSIOLOGY.—Lectures and demonstrations. Lectures on hygiene—personal, domestic, public.

OBSERVATION AND PRACTICE IN TEACHING.—Guild classes, children's classes, and Course for Waitresses.

BUSINESS CUSTOMS AND ACCOUNTS.

ENGLISH LANGUAGE AND LITERATURE.

PHYSICAL TRAINING.—Systematic practice in the Gymnasium.

SENIOR YEAR

FIRST TERM

HOUSEHOLD SCIENCE AND ECONOMICS.—Third Course in Theoretical and Practical Cookery. Invalid Cookery. Instruction in lunch-room cookery. Laundry Course. Preparation of dietaries.

CHEMISTRY.—Organic—lectures and laboratory work.

PHYSIOLOGICAL CHEMISTRY.—Lectures on the relations of food principles.

OBSERVATION AND PRACTICE IN TEACHING.—Guild and other classes.

DOMESTIC ARCHITECTURE.—The planning and building of the house.

PHYSICAL TRAINING.—Systematic practice in the Gymnasium.

SECOND TERM

HOUSEHOLD SCIENCE AND ECONOMICS.—Advanced cookery. Instruction in lunch-room cookery. Preparation of dietaries. Laundry Course. Course in Home Nursing.

CHEMISTRY.—Chemistry of foods and dietetics. Quantitative analysis.

BIOLOGY.—Studies and types of animal life. Animal parasites. Lectures on pathology.

BACTERIOLOGY.—General principles and practical applications.

HISTORY AND INSTITUTES OF EDUCATION.

OBSERVATION AND PRACTICE IN TEACHING.—Nurses, waitresses, laundry, and guild, classes.

PHYSICAL TRAINING.—Systematic practice in the Gymnasium.

Students attend five days a week.

SUBJECTS OF INSTRUCTION

HOUSEHOLD SCIENCE AND ECONOMICS

Lectures on the various subjects related to the economics of the house. These include : Classification of food principles ; water ; salts ; carbohydrates ;

fats; proteids; food adjuncts; baking-powders; fermentation; the preservation of food materials; national and state laws regarding the adulteration of food and the inspection of meat; manufactured food materials; scientific kitchens (public kitchens, school kitchens, and home kitchens); care of the house according to hygienic laws; disposal of waste.

COOKERY.—The systematic courses extend through both years, and include:

First Course.—Instruction in the composition and dietetic value of food materials. The lessons are arranged in logical order, and each principle is illustrated by the preparation of simple dishes. The object of the course is the preparation of food in the most digestible and appetizing forms.

Second Course.—Instruction and practice of an advanced character in the preparation of more complicated dishes and menus than are included in the First Course.

Third Course.—The preparation of still more elaborate and expensive dishes; lessons in marketing and carving; practical demonstration in the cutting of meat.

Fourth Course.—This course is devoted to lunch-room cookery. Larger amounts of material are used than in the preceding courses, and a practical knowledge of the nutritive value and cost of food prepared for lunch-room purposes is thereby obtained.

Fifth Course.—Invalid cookery, including the preparation of food suitable for the sick-room. The course is the same as that given to professional nurses.

COURSE FOR WAITRESSES.—The course includes the following subjects in which every well-trained waitress should be expert: Care of dining-room and pantry; care of silver and cutlery; serving of breakfast, luncheon, and dinner; washing dishes; washing and ironing table-linen; removal of stains.

COURSE IN LAUNDRY WORK.—The instruction in laundry work occupies twelve lessons. The exposition of the scientific principles involved in the various processes is followed by actual practice in the laundry. Soaps, washing-fluids, bleaching-powders, bluing, and starch are discussed in their scientific and practical relations to laundry work.

HOME NURSING.—The furnishing, warming, and ventilating of the sick-room. Bathing, dressing, and administering food and medicine to patients. Practical bandaging, bed-making, lifting and caring for helpless patients. Preparation and application of poultices.

CHEMISTRY

The study of Chemistry is begun in the Junior Year with a general course giving a full exposition of the principles of the science and including the study of the most important elements and their chief compounds. In the Second Term, a qualitative study of the Proximate Food Principles and a practical examination of the more important food materials are undertaken. There are two lectures a week, and one laboratory period of three hours.

In the Senior Year (First Term), Organic Chemistry is taken up, one lecture a week being given, with one laboratory period in which the student prepares and studies a typical compound of each class. During the Second Term, a course of lectures in the chemistry of foods and dietetics is given, the lectures being supplemented by laboratory work. The lectures cover the following topics: Definitions of foods—chemical composition of food materials and of the human body; proximate food principles—protein, fat, carbohydrate, water, mineral matter; value of foods; use of calories; nutrient ratio; metabolism of foods; diet and dietaries; food materials—water (potable and mineral), common salt, starch foods, sugars, fats and oils, cereals, meats, eggs, fish, fruits, vegetables, salads, beverages, food adjuncts; study of fermentation; preparation of food materials; changes that foods undergo in cooking processes.

The Course in Quantitative Analysis, which deals with foods and dietetics, is given in the Second Term of the Senior Year. Practical laboratory experience with the processes in present use for the analysis of food materials is made the basis of the instruction. The laboratory work is of such a character as to furnish data for the calculation of food values as well as to detect adulterations. The following list indicates the general scope of the quantitative work: Chemically pure salts; potable water; common salt; bicarbonate of sodium; flour or bread; baking-powders; sugar or syrups; milk; butter; lard; cheese; tea; coffee; chocolate.

Printed syllabuses are made the basis of the work in chemistry during the Senior Year.

ANATOMY AND PHYSIOLOGY

During the Junior Year, the course of instruction embraces both lectures and demonstrations. The lectures cover the following topics: The general plan of organization of the animal body; the physical and chemical properties of the tissues; the chemical composition and physiological properties of foods and their relative values as nutritive agents; the general process of digestion; the elaboration of food into blood; the circulation of the

blood, respiration, animal heat ; secretion and excretion ; the physiology of the nervous system and special senses with reference to the lectures on psychology. The laboratory demonstrations have reference to the above course of lectures. Lectures are given also embracing the subjects of physical development, physical training, the effects of diet, the care of the skin, clothing, ventilation, household sanitation, emergencies, and similar hygienic topics.

During the Senior Year, the laboratory work includes the following topics : The chemical relation of starch, sugar, fat, and proteids ; the determination of the heat values of food ; the process of fermentation ; the cultivation of micro-organisms and their relation to disease ; dissections of different animal forms generally used as foods. The lectures embrace the following topics : Pto-maines and leucomaines of foods and their influence in the production of disease ; the parasites usually associated with animal foods ; diseases of nutrition, such as gout, diabetes, rickets, scurvy, and rheumatism

BACTERIOLOGY AND MICRO-ORGANISMS OF FERMENTATION

The subject of bacteriology is dealt with chiefly in its normal and sanitary relations. The course includes the examination of air, water, ice, and milk ; the principles of sand filtration, and the testing of the efficiency of filters ; the preparation of culture media and the determination of species ; sterilization, disinfectants, and antiseptics. The fermentation organisms studied are those met with in vinegar-making, bread-making, and dairying.

ENGLISH LANGUAGE AND LITERATURE

The course includes the study of prose style in a few representative writers, with reference to diction, figures, explicit reference, paragraphing, arrangement of material, description, narration, expression, argumentation. The aim of the course is to develop the ability of the student in logical thinking and in effective expression of thought, both orally and in writing.

BUSINESS CUSTOMS AND ACCOUNTS

A practical course in single-entry bookkeeping, involving the use of day-book, ledger, cash-book, bill-book, etc. Students are required to make out bills and receipts, to use check-books and pass-books, and to make deposits in the bank, using the proper forms. This practical work is supplemented with lectures on business customs, notes, drafts, letters of credit, and banking.

DOMESTIC ARCHITECTURE

A course of lectures on the following subjects :

FIRST LECTURE.—The Location and Surroundings of the House. The placing of the house. Topography. Drawings of site. Opportunities of situation. Cost of houses and general method of figuring them.

SECOND LECTURE.—The House in Detail. The rooms and their position in the house. The basement ; first floor ; second floor ; attic. The materials used in their construction, as they interest the housekeeper.

THIRD LECTURE.—The Planning of Suburban Houses. When a wooden house is preferable ; when a masonry house—stone or brick. Style of architecture.

FOURTH LECTURE.—The Simple City House. Fire limits. Planning of the city house as to economy of space and conveniences. The architectural character of the front. Architectural details of the interior.

FIFTH LECTURE.—Sanitation of the House. Heating and ventilation. Water-supply and drainage. Plumbing. Lighting. The kitchen. Importance of sanitary arrangements of the house.

HISTORY AND INSTITUTES OF EDUCATION

During the Second Term of the Senior Year, a course of lectures is given by the President of the Institute in The History of Theories of Education, attention being concentrated upon the progress of education during the past three hundred years. The practical organization and management of school work is also fully discussed, and the special relations of technical and industrial training to general education are carefully elaborated.

In connection with the lectures, meetings are held for the discussion of the leading topics presented, and students are required to prepare papers which form the basis of these discussions.

PHYSICAL TRAINING

Students taking this course must attend the Institute classes in Physical Training twice a week. The close connection between bodily training and the instruction in physiology and hygiene is kept in view throughout the entire course.

DIPLOMA

A diploma is given to students who finish the course.

ADMISSION

For admission to the Normal Course in Domestic Science, at least a high school education or its equivalent is required. The diploma of approved institutions is accepted in lieu of an examination. The number of students that can be received is limited.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Normal Course, *forty dollars* per term.

A deposit of *five dollars* is required of each student, to cover breakage in the Chemical Laboratories. This is returned at the close of the term, less the cost of the apparatus destroyed.

Students supply their own text-books and stationery.

There are two terms in the year, beginning, respectively, in September and February. New classes are formed only at the beginning of the year.

EQUIPMENT

The appointments and equipment for the various branches of instruction are unsurpassed. The Chemical and Biological Laboratories are supplied with the newest and most approved forms of apparatus. There are three large school-kitchens furnished with every convenience, and intended to serve as models in all their sanitary arrangements. The Laundry is a large, finely-appointed room, with all the most recent appliances for every form of laundry work. Everything necessary for the scientific instruction, as well as for the practical training, of the students is provided.

GYMNASIUM

The Gymnasium is a well-lighted and well-ventilated hall. In connection with the Gymnasium, there are suites of dressing-rooms, and finely-appointed marble baths with hot and cold water.

LIBRARY

The Library, which contains thirty thousand volumes, is supplied with an extensive collection of books, and the Readingroom with the best periodicals, relating to the subjects taught in the course.

DEPARTMENT OF DOMESTIC ARTS

COURSES IN DRESSMAKING

INSTRUCTORS

- CAROLINE A. M. HALL, Director,
Instructor in the Theory and Practice of Dressmaking.
- MARY L. SARGENT,
Instructor in Dressmaking.
- MARY E. EASTWOOD,
Instructor in Dressmaking.
- JENNIE COLLINGWOOD,
Instructor in Dressmaking.
- MARY HENLEIGH BROWN,
Instructor in Sewing and Dressmaking.
- EUPHEMIA G. KERR,
Instructor in Dressmaking.
- HÉLÈNE ZOGBAUM,
Instructor in Design in Dressmaking.
- PROFESSOR ERNEST A. CONGDON, Ph. B.,
Lecturer on the Chemistry of Textiles, Dyeing, and Cleansing.
- PROFESSOR JOHN T. HOLDSWORTH,
Lecturer on Business Customs and Accounts.
- MAUDE G. HOPKINS,
Director of Physical Training.
-

COURSES OF INSTRUCTION

The following courses in Dressmaking are offered :

- I. GENERAL COURSE.
- II. TECHNICAL COURSE.

III. COSTUME DESIGNING.

IV. COURSE IN SEWING.

V. EVENING CLASSES.

I. GENERAL COURSE

The General Course of Instruction consists of four grades, each occupying one term, or half the academic year. The four consecutive grades are essential to thorough training in the practice of the art.

All materials, except those supplied in the Third and Fourth Grades for ordered work, must be furnished by the students.

All work cut and planned in the classroom must be finished at home.

FIRST GRADE

This grade is devoted to the fundamental principles of dressmaking. One plain dress is completed. Two lessons, of two hours each, are given weekly.

SUBJECTS OF INSTRUCTION

- I. Implements and appliances used in dressmaking.
- II. Cotton staple, its various uses ; choice of materials ; textiles as to color and application to dress.
- III. Taking measurements ; drafting foundation skirt ; drafting draperies and principles of same ; finishing skirt for trimming or draping ; making lined skirt.
- IV. Form, proportion, and line relating to ornament in dress.
- V. Plans for completing skirts ; cutting waists with seams from patterns drafted by students of the advanced grades, from measurements taken from different members of the class ; basting, fitting ; planning trimming ; general finish.
- VI. Drawing—outline and light and shade.

SECOND GRADE

In this grade, attention is paid to taking measurements of different figures and to drafting patterns from the same. The first dress made is of plain material ; the second is a waist or entire garment of striped or plaid material ; the third, a garment on the gown-form. Two lessons, of two hours each, are given weekly.

Instruction is provided also in accounts, business forms, and correspondence, two lessons, of one hour each, being given weekly during this term.

SUBJECTS OF INSTRUCTION

- I. Color and textiles ; their various uses and relations to personal adornment ; growth of wool and silk ; manufacture of fabrics.
- II. Taking measurements ; drafting plain waist from different measurements ; drafting waist with extra seams for large figure ; cutting and matching striped, plaid, or figured material for waist—making and trimming the same ; drafting and making dresses on the gown-form.
- III. Artistic dress in its relation to the body ; design in drapery.
- IV. Making dress on gown-form from the student's own design.
- V. Drawing—proportions of the human figure ; draperies and gowns in black and white and in color ; color values.

THIRD GRADE

The work of this grade is chiefly an extension of that of the two preceding grades, with the additional subjects of instruction named below. For further practice, students may receive and execute orders. Two lessons, of two hours each, are given weekly.

SUBJECTS OF INSTRUCTION

- I. Advanced drafting. Choice of materials for gowns of special character.

- II. Making dinner dress, evening dress ; choice of materials for the same. Handling of velvet.
- III. Making models of inexpensive materials to test the design.
- IV. The form and poise of the body in their relation to dress.
- V. Child's dress—materials, drafting, cutting, and making the same.
- VI. Drawing—rendering of dresses in black and white ; design and ornament ; lace and passementerie ; textiles.

FOURTH GRADE

This grade completes the General Course. It includes instruction in tailor finish, as applied to dresses, jackets, and coats. Orders may be received and executed by students. Two lessons, of two hours each, are given weekly.

SUBJECTS OF INSTRUCTION

- I. Materials used in making coats, as staple and manufactured.
- II. Drafting jackets and coats of various styles ; cutting, basting, fitting, pressing ; practice in making pockets, applying same to garments ; making button-holes, sewing on buttons ; lining and finish of coat ; making collars.
- III. Principles applied to tailor-made dresses.
- IV. Drawing—designing of costumes in color and monochrome.

A course of lectures in the chemistry of textiles, dyeing, and cleansing is given during the second term of each year.

II. TECHNICAL COURSE

This course is arranged to meet the needs of those who wish to become professional dressmakers. The course extends through one year and comprises all the work of the General Course. It provides additional practice in executing orders, which students may take on their own account during the second half of the year.

Four hours daily, except on Saturday, are given to dressmaking. Additional time is required for the other branches.

Students receive the full course of instruction in drawing and water-color, and in the keeping of accounts, business forms, and correspondence, given in the General Course.

The students of this course have the privilege of physical training in the Gymnasium without the payment of an additional fee.

For admission, each applicant must be at least eighteen years of age, and have a good knowledge of hand and machine sewing, and must present for inspection a lined dress made by herself from patterns.

Applicants are admitted to this course only in September of each year, and for the entire course.

III. COSTUME DESIGNING

This course is intended for students desiring to specialize as illustrators and designers of costume. The full course of instruction includes elementary drawing from the cast, sketching from the draped figure, still life, free-hand perspective, water-color, and elementary composition. Ample use is made of the extensive collection of books on costume in the Library and of the textiles in the Museum.

The full course occupies two years.

CERTIFICATES

Certificates are granted to students who satisfactorily finish all the grades and meet all the requirements of any of the courses.

IV. COURSE IN HAND AND MACHINE SEWING

The Course in Sewing includes the simple stitches used in hand and machine sewing and their application in the making of garments. Work cut and planned in the classroom must be completed at home. All materials are supplied by the student.

Students who have not had the necessary preliminary training or experience in hand and machine sewing are expected to take this course, in whole or in part, before beginning the dressmaking work.

The course occupies three terms. Two lessons, of two hours each, are given weekly.

Students who can meet the requirements of the preceding grades will be admitted to advanced standing.

Applicants must have a good elementary education.

SUBJECTS OF INSTRUCTION

First Grade.—History of implements used in hand sewing ; kinds and qualities of materials for undergarments ; proper position of the body in sewing ; methods of using thread and needles, thimble, and tape-measure ; woven textiles ; different kinds of stitches ; combination of stitches ; seams, hems, tucks ; button-holes ; making simple garments.

Second Grade.—Sewing machines ; measurements ; drafting and making undergarments of different designs.

Third Grade.—Drafting, cutting ; making shirt-waists, cotton dresses, and garments for infants ; embroidery for marking linen.

ADMISSION

For admission to the courses in Dressmaking, applicants must be at least eighteen years of age and must be able to do hand and machine sewing. An examination in sewing is held at the beginning of each term.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

GENERAL COURSE

First Grade, *fifteen dollars* per term.

Second Grade, *twenty dollars* per term, including the price of the drafting chart.

Third Grade, *twenty dollars* per term.

Fourth Grade, *twenty dollars* per term.

TECHNICAL COURSE.—*Thirty dollars* per term.

COSTUME DESIGNING.—*Twenty-five dollars* per term.

SEWING COURSE.—*Twelve dollars* per term.

There are two terms in the year, beginning, respectively, in September and February. In the General Course, students enter for one term at a time.

EVENING CLASSES

In the Evening Classes, instruction is given in the First, Second, and Third Grades of the General Course in Dressmaking. Each grade occupies one session. There is also a class in Sewing.

The session extends through six months, from the beginning of October to the end of March.

In each grade, two lessons, of two hours each, are given weekly.

Full details will be found on page 231.

COURSES IN MILLINERY

INSTRUCTORS

- EMILY G. SWETT, Director,
Instructor in the Theory and Practice of Millinery.
- CORA FOX,
Instructor in Millinery.
- SOPHIA GLOECKNER,
Instructor in Millinery.
- HÉLÈNE ZOGBAUM,
Instructor in Design in Millinery.
- PROFESSOR JOHN T. HOLDSWORTH,
Lecturer on Business Customs and Accounts.
- PROFESSOR ERNEST A. CONGDON, Ph. B.,
Lecturer on the Chemistry of Textiles, Dyeing, and Cleansing.
- MAUDE G. HOPKINS,
Director of Physical Training.

COURSES OF INSTRUCTION

The following courses in Millinery are offered :

- I. GENERAL COURSE.
- II. TECHNICAL COURSE.
- III. EVENING CLASSES.

I. GENERAL COURSE

The General Course in Millinery consists of three consecutive grades, each occupying one term. In each grade two lessons in millinery, of two hours each, are given weekly.

This course includes also instruction in drawing and water-color, for the purpose of giving the students a knowledge of line and form, and the ability to execute designs for the various kinds of hats in monochrome and color. One lesson, of one and one-half hours, is given each week, throughout the three grades.

Instruction is provided also in accounts, business forms, and correspondence, two lessons a week being given throughout the grade in which the work may be taken.

A course of lectures in the chemistry of textiles, dyeing, and cleansing is given in the second term of each year.

All materials used are selected and furnished by the students.

Constant use is made of the extensive collection of books in the Library and of the important collection of textiles in the Museum. The leading American and foreign fashion periodicals are supplied in the millinery rooms.

FIRST GRADE

In this grade, the work begins with the study of the hat in detail. The methods of preparing the various fittings for the brim are taught upon a straw and a felt hat, canton-flannel and cheese-cloth being used which represent, respectively, velvet and crêpe. After each exercise of fitting the brim, the hats are trimmed with suitable bows of sateen which serves as ribbon. The knowledge so gained is then applied in the making of one hat of choice materials.

SUBJECTS OF INSTRUCTION

- I. Color and materials as related to the head-dress.
- II. Wiring ; folds ; fitted facing ; shirred facing ; puffed edge.

- III. Bows and rosettes.
- IV. Study of line and form as applied to frame-making; buckram hat-frames.
- V. Fitted hat made, lined, and trimmed.
- VI. Manufactures of straw and felt hats, velvet, and ribbon explained. Hat of choice material made.

SECOND GRADE

In this grade, the bonnet and toque are studied, using for practice materials that are appropriate for the purpose. The latter part of the grade is devoted to the making of bonnets and toques of choice materials.

SUBJECTS OF INSTRUCTION

- I. Bonnet with plain crown and with puffing, made, lined and trimmed.
- II. Bonnet of more complex design.
- III. Toque made, lined, and trimmed.
- IV. Practical work, regulated by the season in which the grade is studied, and leading to a knowledge of the designing of bonnets and hats. At least four pieces of millinery must be made by each student.

THIRD GRADE

Throughout this grade students work in choice materials, to gain confidence and experience; they are allowed to receive and execute orders.

SUBJECTS OF INSTRUCTION

- I. Crêpe bonnet.
- II. Silk bonnet or hat.
- III. Growth and manufacture of silk explained.
- IV. Wire frame-making.
- V. Hats adapted to the season.
- VI. Evening bonnet from student's own design.
- VII. Shirred hat.

GRADUATE WORK

Students who have finished the three grades of the General Course may remain another term for the purpose of doing more original work and gaining additional practice in dealing with the designs and materials appropriate to the two millinery seasons. The work may consist largely of orders taken by the student.

II. TECHNICAL COURSE

The Technical Course is designed to train students to become practical milliners. In this course the work included in the three terms of the General Course is accomplished in one year.

Three hours on four days of the week—Monday, Tuesday, Thursday, and Friday—are given to millinery. Additional time is required for the other branches.

Applicants are admitted only in September of each year, and for the entire course.

Students of the Technical Course have the privilege of physical training in the Gymnasium, twice a week, without the payment of an additional fee.

CERTIFICATE

A certificate is granted to students who satisfactorily complete the three grades of the General Course. A certificate is given also to students who complete the Technical Course and pass all the required examinations.

ADMISSION

For admission to any of the courses, students must be at least eighteen years of age and must have a good knowledge of hand sewing. For admission to the Technical

Course, applicants are required to present for inspection a piece of millinery, the work upon which must be executed in the classroom of the Institute.

FEEES AND TERMS

General Course, *twelve dollars* per term.

Technical Course, *thirty dollars* per term.

There are two terms in the year, beginning, respectively, in September and February.

EVENING CLASSES

In the Evening Classes, instruction is given in the first and second grades of the General Course. The session extends through six months, from the beginning of October to the end of March. Two lessons, of two hours each, are given weekly. The fees for the session are *three dollars* for the first grade, and *five dollars* for the second grade. Full details will be found on page 233.

NORMAL COURSE IN DOMESTIC ARTS

INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

CAROLINE A. M. HALL,
Director.

EMILY G. SWETT,
Director of the Millinery Courses.

HÉLÈNE ZOGBAUM,
Instructor in Design in Dressmaking and Millinery.

HARRIET L. MASON,
Professor of English Language and Literature.

MARY L. SARGENT,
Instructor in Dressmaking.

MARY E. EASTWOOD,
Instructor in Dressmaking.

JENNIE COLLINGWOOD,
Instructor in Dressmaking.

MARY HENLEIGH BROWN,
Instructor in Sewing and Dressmaking.

EUPHEMIA G. KERR,
Instructor in Dressmaking.

ALBERT P. BRUBAKER, M. D.,
Professor of Human Physiology and Hygiene.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

JOHN T. HOLDSWORTH,
Professor of Business Customs and Accounts

MAUDE G. HOPKINS,
Director of Physical Training.

PRESIDENT MAC ALISTER lectures on the fundamental principles of Manual Training and the educational value and relations of the Domestic Arts.

This course is intended for the training of teachers of domestic arts in public, industrial, and normal schools. It includes the full courses in sewing, dressmaking, and millinery given in the General Courses in these branches, and such additional branches as are necessary to give the teacher a thorough and comprehensive knowledge of dress in its relations to the individual and to society. The supply of thoroughly trained instructors in this department of school work is quite inadequate to the demand.

The Gymnasium is a large, well-lighted, and well-ventilated hall. In connection with the Gymnasium, there are suites of dressing-rooms, and finely appointed marble baths with hot and cold water.

The Library is supplied with an extensive collection of books and the Reading-room with the best periodicals relating to the subjects taught in the course.

COURSE OF INSTRUCTION

The course occupies two years. Attendance is required five days each week.

JUNIOR YEAR

FIRST TERM

SEWING.—Theory and practice of hand and machine sewing. The making of simple garments. Skirt drafting.

DRESSMAKING.—First Grade of the General Course. Study of the construction and making of dresses for general use.

MILLINERY.—First Grade of the General Course. Preparation of materials. Study of the hat. Bow-making.

DRAWING.—Outline and light and shade. Color studies.

BUSINESS TRAINING.—Accounts and business forms.

PHYSICAL TRAINING.—Systematic training in the Gymnasium.

SECOND TERM

SEWING.—Second Grade. The drafting, cutting, and making of undergarments from various designs.

DRESSMAKING.—Second Grade of the General Course. Drafting for waists. Making three full garments.

MILLINERY.—Second Grade of the General Course. Suitable materials are first used for practice; the designs are afterward developed in the finished hat made of choice materials.

DRAWING AND COLOR WORK.—Proportions of the human figure. Draperies, bows, feathers as hat-trimming, in black and white and in color. Color values.

PHYSICAL TRAINING.—Systematic training in the Gymnasium.

Lectures and demonstrations on special topics are given throughout the year.

SENIOR YEAR

FIRST TERM

SEWING.—Third Grade. Theory and practice of drafting and making shirt-waist suits; garments for infants. Embroidery.

DRESSMAKING.—Third Grade of the General Course. Drafting and making elaborate dresses from original designs.

MILLINERY.—The designing and elaboration of hats, toques, and bonnets.

COSTUME.—Early and medieval periods.

BASKETRY AND WEAVING.

DRAWING AND DESIGN.—Rendering of dresses and gowns in black and white and in color. Designing of hats, bonnets, and toques, in black and white and in color.

ENGLISH LANGUAGE AND LITERATURE.—Paragraph and theme writing. Reading of selected English classics.

OBSERVATION AND PRACTICE IN TEACHING.—Guild classes, industrial institutions, and Institute classes.

LECTURES on subjects related to the work.

LECTURES on Human Physiology and Hygiene with special reference to dress.

PHYSICAL TRAINING.—Systematic training in the Gymnasium

SECOND TERM.

SEWING.—Exercise in dress finishing.

DRESSMAKING.—Fourth Grade of the General Course.
Wool and woolen textiles.

MILLINERY.—Original design in head-dress.

HISTORY OF COSTUME.—Class work and lectures with pictorial and stereopticon illustrations.

BASKETRY and its relations to the weaving of cloth.

DRAWING AND DESIGN.—Designing of costumes and head-dresses in color.

OBSERVATION AND PRACTICE IN TEACHING.—Guild classes and Institute Department classes.

EMERGENCIES.—Practical demonstrations.

LECTURES on the Chemistry of Textiles, Dyeing, and Cleansing.

PHYSICAL TRAINING.—Systematic training in the Gymnasium.

Lectures and demonstrations on special topics are given throughout the year.

DIPLOMA

A diploma is granted to students who complete the course.

EQUIPMENT AND LIBRARY

The Dressmaking and Millinery classrooms are supplied with every appliance and equipment necessary for the instruction.

Constant use is made of the extensive collection of books on costume in the Library and of the collection of textiles belonging to the Museum. The leading American and foreign fashion periodicals are supplied in the dressmaking rooms.

Courses of reading and study in the history of costume are arranged for students desirous of pursuing the same.

ADMISSION

For admission to the Normal Course in Domestic Arts, applicants must give satisfactory evidence of a good general English education. They must present for inspection an article of wearing apparel as a specimen of their hand sewing.

FEES AND TERMS

Fee, *forty dollars* per term.

All materials, stationery, and note-books are supplied by the student.

There are two terms in the year, beginning, respectively, in September and February.

Applicants are admitted to the course only in September.

SUBJECTS OF INSTRUCTION

SEWING

FIRST GRADE.—The first half of the Junior Year is devoted to practice in the various kinds of hand and machine sewing, and to the elementary drafting, cutting, fitting, and making of undergarments.

Instruction is given in the preparation of the various fibres used in the manufacture of washable materials suitable for undergarments—form, style, and line being carefully considered.

The history of implements and their proper uses.

SECOND GRADE.—The fabrics best suited for more elaborate garments; combination of materials and ornament; the selection and the purchase of materials; design and color; drafting, cutting, fitting, and making, by hand and machine, dainty lingerie. Embroidery, laid-work, scallops, initials for marking linen.

THIRD GRADE.—Instruction in selecting materials best fitted for shirt-waist suits and unlined dresses of washable materials. Kimonos, infant's and children's outfits. Treatment and use of cotton textiles. Preparation of lace and embroidery. Ornamentation of garments. Cross-stitch or Russian embroidery. Drawn-work. Drafting, cutting, fitting, and making of garments.

DRESSMAKING

FIRST GRADE.—Instruction in the fundamental principles of making lined dresses; combination of materials and linings; the general finish of gar-

ments ; boning ; the use of stiffening. Materials and the different staples used in their manufacture. Combination of texture and color. Shopping and purchase of goods. The designing and drafting of skirts ; cutting, fitting, and making a lined skirt and a skirt over a foundation, with the waist, making in all three garments.

SECOND GRADE.—The study of form and color ; the combination of different dress fabrics, with their relation to the more artistic lines in the finished garment ; design and simple decoration ; measurements taken and drafting from different models, including gowns made on the princess form ; the proper selection and use of striped and figured materials ; draperies and their uses. Three garments are completed, the drafting, planning, cutting, and finish from the design being performed by the student.

THIRD GRADE.—Preparation of garments made from more elaborate and expensive materials and of special character ; consideration of textures best adapted to the reception and the dinner dress ; the evening gown ; lined dresses for children. Study of personality ; drafting with this end in view.

FOURTH GRADE.—This grade includes the drafting and making of garments of more severe and tailor-made effects ; cutting, basting, fitting, pressing, practice in making pockets, collars, lining, and finish of the coat ; making buttonholes ; sewing on buttons ; the general finish of the garments.

DRAWING AND DESIGN

Drawing—outline, perspective, light and shade, proportion of the human figure ; draperies, bows, feathers, hat trimmings, dresses and gowns, lace, ornamentation, hats, bonnets, and toques, in black and white ; study of color values and the appearance of objects. Design and decoration, fabrics and textures used in draperies, gowns, and hats suitable and becoming to different types ; historic costume and costume for different occasions ; composition and illustration of the various objects.

HISTORY OF COSTUME

During the Senior Year, a course of lectures is given in the History of Costume, from the earliest period to the present time. These lectures are illustrated by lantern slides, reproductions of ancient and modern pictures, and by fashion-plates.

BASKETRY AND WEAVING

Instruction is given in the methods of making baskets of different weaves and shapes, in cord, raffia, reed, and other materials. Variety of form and design caused by the difference in handling creates an interest in the work and develops a feeling for good form, as well as originality in design. Weaving different patterns in mats and other articles illustrates the making of cloth, and increases the interest in the decorative result, while affording training in firmness of touch and dexterity in handling any material.

LECTURES ON TEXTILES, DYEING, AND CLEANSING

This course includes a brief historical sketch of the use of textiles and the art of dyeing.

This is followed by a description of the more important textiles—cotton, flax, ramie, wool, and silk—and of the microscopical and chemical methods of ascertaining their organic structure.

The materials used in dyeing and the operations preliminary to it, and the chemistry of washing, cleansing, bleaching, and dyeing, are explained.

Some account is given of the natural and artificial coloring matters and of the chemistry of the coal-tar colors, which completes the course.

ENGLISH LANGUAGE AND LITERATURE

The course includes the study of prose style in a few representative writers, with reference to diction, figures, explicit reference, paragraphing, arrangement of material, description, narration, expression, argumentation. The aim of the course is to develop the ability of the student in logical thinking and in effective expression of thought, both orally and in writing.

BUSINESS CUSTOMS AND ACCOUNTS

A practical course in single-entry bookkeeping, involving the use of day-book, ledger, cash-book, bill-book, etc. Students are required to make out bills and receipts, to use check-books and pass-books, and to make deposits in the bank, using the proper forms. This practical work is supplemented with lectures on business customs, notes, drafts, letters of credit, and banking.

PHYSICAL TRAINING

Students taking this course must attend the Institute classes in Physical Training twice a week. The close connection between bodily training and the instruction in physiology and hygiene is kept in view throughout the entire course.

JUNIOR COURSE
IN
DOMESTIC SCIENCE AND ARTS
AND
ADVANCED ELECTIVE COURSES

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

ALICE M. BRENNAN, Director,
Instructor in English.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

HARRIET L. MASON,
Professor of English Language and Literature.

KATHARINE D. BROWN, B. S.,
Instructor in Mathematics.

ALICE ELIZABETH CHASE, B.A.,
Instructor in History.

JOHN T. HOLDSWORTH,
Professor of Civics and Business Methods and Accounts.

ABRAHAM HENWOOD, B. S.,
Instructor in Chemistry.

PRESCOTT A. HOPKINS, M. S.,
Lecturer on Domestic Architecture.

CAROLINE A. M. HALL,
Director of the Courses in Dressmaking.

174 JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS

EMILY G. SWETT,

Director of the Courses in Millinery.

CORA FOX,

Instructor in Millinery.

MARY H. BROWN,

Instructor in Sewing.

MARY E. FRATZ,

Instructor in Drawing.

HARRIET P. MITCHELL,

Instructor in Cookery.

JENNIE COLLINGWOOD,

Instructor in Dressmaking.

MAUDE G. HOPKINS,

Director of Physical Training.

COURSES OF INSTRUCTION

The following courses are offered :

I. JUNIOR COURSE.

II. ELECTIVE COURSES FOR ADVANCED STUDENTS.

I. JUNIOR COURSE

The Junior Course is a non-professional course of prescribed studies for girls, and is designed: (1) To supply that training for the duties and responsibilities of home life which the ordinary academic education fails to give; (2) to lay a broad and solid foundation for the technical work involved in the direct preparation for a profession or a skilled occupation. The course of instruction covers two years.

The course is based upon the recognition of the fact that the training for the practical business of life should have its due place in the education of the individual during the

plastic period of life. Experience is constantly showing the soundness of this position.

Of the classes that have thus far been graduated, more than three-fourths of the pupils have developed aptitudes for one or another of the arts and sciences, and have taken advanced courses in chemistry, physiology and hygiene, domestic science, millinery, or dressmaking, with a view, in each case, to following the pursuit as a profession.

As a result of this preparatory training in a well-arranged and soundly correlated course of study, these pupils have the advantage of entering upon the pursuit of their technical courses with good habits of thought and study, and with the ability to feel an intelligent delight in their work.

The course is divided broadly into scientific work, academic work, and technical work—about one third of the time being given to each.

The list of studies is as follows :

JUNIOR YEAR

FIRST TERM

LANGUAGE AND LITERATURE.—Diction, punctuation, letter-writing. Idylls of the King. History of American literature.

GENERAL HISTORY.—Ancient history.

MATHEMATICS.—Review of principles of arithmetic and the metric system, introductory to the study of algebra; algebra begun.

DOMESTIC SCIENCE AND ARTS.—Household economics; cookery—practical instruction in the school-kitchens; talks on foods. Sewing. Millinery.

BUSINESS CUSTOMS AND ACCOUNTS.

DRAWING.—Free-hand; sketching.

176 JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS

SECOND TERM

LANGUAGE AND LITERATURE.—Figures of speech, sentence structure, etymology, composition. History of American literature.

MATHEMATICS.—Elementary algebra completed, including quadratic equations.

GENERAL HISTORY.—Medieval and modern European history.

DOMESTIC SCIENCE AND ARTS.—Household economics; cookery—practical instruction in the school-kitchens; talks on foods. Sewing. Millinery.

BUSINESS CUSTOMS AND ACCOUNTS.

DRAWING.—Free-hand; sketching.

PHYSICAL TRAINING in the Gymnasium, twice a week, throughout the year.

CURRENT EVENTS one hour a week during the year.

SENIOR YEAR

FIRST TERM

LANGUAGE AND LITERATURE.—Choice of words, phraseology, synonyms. Selected plays of Shakespeare. History of English literature.

ENGLISH HISTORY.

SCIENCE.—Elements of general chemistry—lectures, laboratory work, and recitations.

DOMESTIC SCIENCE AND ARTS.—Household economics; lectures on care of the house; practical instruction in the school-kitchens. Dressmaking.

DOMESTIC ARCHITECTURE.—The planning and building of the house.

CIVICS.—The principles and practical operation of civil government in the United States.

LECTURES on The History of Art.

SECOND TERM

LANGUAGE AND LITERATURE.—The paragraph, composition, principles of style. Selected plays of Shakespeare. History of English literature.

ENGLISH HISTORY.

SCIENCE.—Elements of general chemistry—lectures, laboratory work, and recitations.

DOMESTIC SCIENCE AND ARTS.—Dressmaking.

CIVICS.—Continued.

THE DECORATION AND FURNISHING OF THE HOUSE.

II. ELECTIVE COURSES FOR ADVANCED STUDENTS

The Elective Courses are intended only for advanced students who are qualified to make a choice of studies for specialization. These courses are designed for young women who desire a course of training in the sciences or arts, combining with such training, when necessary, courses in the academic branches.

Students may elect a single study or a group course from the several courses specified below.

The Institute affords superior advantages for students who wish to specialize. The following subjects are offered :

SCIENCE.—Mathematics, Physics, Chemistry, Physiology and Hygiene, Physical Training. (See Special Circulars for the various courses.)

ENGLISH.—Rhetoric and Composition, American and English Literature, Prose Style, Victorian Poets, Contemporary Poets, Civics and History. (See Special Circulars.)

DOMESTIC SCIENCE AND ARTS.—Cookery, Millinery, Dressmaking, Household Economy, Chemistry of Foods.

SUBJECTS OF INSTRUCTION

The following outlines furnish information frequently asked for concerning some of the subjects of instruction embraced in the Junior and the Elective Courses.

ELEMENTARY CHEMISTRY

A systematic course, extending throughout the year. The student devotes three hours a week to the study, two hours being given to laboratory work and one hour to lectures and recitations. There are occasional written examinations, held at the discretion of the instructor. While the course is elementary in its nature, it is intended to train the student in the power of observation, to give correct interpretations of what is observed, and particularly to inculcate a scientific habit of thought and reasoning. Nor is the training in manipulation and the arrangement of apparatus the least valuable part of the course.

HOUSEHOLD ECONOMICS

This term covers broadly the instruction in the various subjects that relate to the growth and well-being of the household and of organized society. The instruction is given in a series of lectures and lessons systematically arranged with a view to correlating kindred subjects in their bearing upon the household and upon social life and organization.

The following general outline indicates the scope of the work. It will be noted that every part of the instruction capable of demonstration has its outcome in actual laboratory work.

During the Junior Year, instruction is given in the following subjects: The chemistry of food in its relation to the body; composition of foods; combinations of foods; economy in foods; combustion; classification of food principles—water, ash, carbohydrates, fat, proteids; proportion of food principles present in vegetables, cereals, eggs, milk, cheese, meat, fish; yeast; baking-powders; food adjuncts.

The instruction in cookery during the Senior Year embraces a thorough course in all the ordinary processes of cookery, with individual practice at each lesson. Each pupil performs the whole of the process treated in the lesson, and produces a complete dish from a given receipt. Of the three hours a week, two are given to practice and one to theory.

Lectures are given on the care of the house, including: The kitchen; chemicals for household use; care and cleaning of silver, nickel, iron, paints, copper, tin, marble, woodwork, brass, zinc, porcelain, glass; disposal of

household waste; water supply; filtration of water; heating and lighting; care of lamps; care of the dining-room; laundry of table linen; removal of stains; laundry of lace; care of bath-room and bed-room.

The lectures cover one hour each week, followed by practice in the school-kitchens.

SEWING

Practice is given in the various stitches upon small pieces of material varying from coarser to finer texture. Students provide these materials. Three lessons of one hour a week are given, embracing: *First Term*—Training in measuring by tape-measure and by the eye; basting and overhanding; turning hem by measure, hemming, and running; stitching, combination of stitches; hemstitching; fells; gathering, stroking gathers, and putting on bands; tucks; making a fancy apron. *Second Term*—Sewing machine; making button-holes and eyelets; sewing on buttons; putting in gussets; plackets; mending and patching; drafting, cutting, and making three undergarments.

MILLINERY

The fundamental principles of trimming and making hats, with thorough practice in wiring, binding, puffing, facing (plain and shirred), covering of buckram frames, trimming hats in choice materials, making of shirred hats. The course fits the pupil to do thoroughly all her home millinery, and forms a solid basis for a professional course.

DRESSMAKING

Talks on materials used in a dress—manufacture from staple articles; cotton, wool, silk, etc.; talks on color and color combinations in materials; linings and trimmings; drafting for skirt; purchase of materials; planning, cutting, and making a house-dress; making a separate skirt; making a shirt-waist; planning, cutting, and making gown for graduation.

DOMESTIC ARCHITECTURE

FIRST LECTURE.—The Location and Surroundings of the House. The placing of the house. Topography. Drawings of site. Opportunities of situation. Cost of houses and general method of figuring them.

SECOND LECTURE.—The House in Detail. The rooms and their position in the house. The basement; first floor; second floor; attic. The materials used in their construction, as they interest the housekeeper.

THIRD LECTURE.—The Planning of Suburban Houses. When a wooden house is preferable; when a masonry house—stone or brick. Style of architecture.

180 JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS

FOURTH LECTURE.—The Simple City House. Fire limits. Planning of the city house as to economy of space and conveniences. The architectural character of the front. Architectural details of the interior.

FIFTH LECTURE.—Sanitation of the House. Heating and ventilation. Water-supply and drainage. Plumbing. Lighting. The kitchen. Importance of sanitary arrangements of the house.

BUSINESS TRAINING

A course of instruction designed to acquaint women with those common business facts and principles which have been generally omitted in a woman's education. The following topics indicate the nature of the instruction: What is money? How is it circulated? What is a bank? A trust company? How do banks and trust companies make their money? Women as stockholders and bondholders. Business papers—checks, promissory notes, etc. Capital and credit, failures, assignments, the legal status of women. Practical work in drawing checks, notes, etc., and in keeping a simple set of books—cash-book, day-book, and ledger—by double entry.

PHYSICAL TRAINING

The importance of physical training in mental and moral, as well as in physical, development can scarcely be overestimated. Great care has therefore been taken to formulate a system of training in accordance with the best recognized theories of human development. The Gymnasium is thoroughly fitted up with the newest and best apparatus for the work, including the bath with all necessary appliances.

Regular students are required to take this course, and special students are strongly advised to do so. In the case of regular students, no additional fee is charged for the course in the Gymnasium.

ATTENDANCE

In the Junior Course, attendance five days a week, and, upon an average, five hours a day, is required. Work begins at 9 a. m., and continues to such hours (up to four o'clock) as the program of studies demands.

JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS 181

The attendance for the elective Courses varies according to the program for the selected course of study.

GRADUATION

A Diploma is awarded to students who complete the prescribed course.

A Certificate is awarded to students who complete an Elective Course consisting of subjects approved by the Director.

LABORATORIES AND WORKROOMS

The laboratories and workrooms of the Institute are equipped with all the latest appliances, and every facility is afforded the student to pursue the work in a thoroughly scientific manner.

LIBRARY AND MUSEUM

Constant use is made of the Library, in connection with the several lines of study and training. It contains thirty thousand volumes, including works in every department of art, literature, science, and technology. The Reading-room is liberally supplied with periodicals.

The Museum, which contains collections in every department of industrial art and a collection of paintings, is an important adjunct to several of the branches of instruction.

ADMISSION

For admission to the Junior Course, applicants must have at least a good elementary education. An examination in English, United States History, Geography, and Arithmetic is required. Applicants for the Elective Courses must have such preparation as will enable them to pursue profitably the subjects chosen.

A high school diploma, or a certificate or diploma of any institution of equal grade with the high school, may be accepted in lieu of an examination, provided the application is made in person.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Junior Course, *thirty-five dollars* per term. Advanced and Elective Courses, according to the group of subjects chosen.

The cost of the materials used in the science and the cookery classes is included in the fee.

All the materials used in the dressmaking and millinery classes and all text-books and stationery are supplied by the student.

A deposit of *five dollars* must be made by each student taking chemistry or physics, to cover breakage in the laboratory. This is returned at the close of the year, less the cost of the apparatus destroyed. A deposit of *fifty cents* per term is required also as security for the return of the locker key.

There are two terms in the year, beginning, respectively, in September and February.

LIBRARY SCHOOL

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D.,
President of the Institute.

ALICE B. KROEGER, Librarian and Director of the Library School,
Instructor in Cataloguing, Library Economy, and Reference
Work.

SARAH WARE CATTELL,
Assistant Librarian and Instructor in Library Economy and
Studies of Books and Authors.

FANNIE S. MATHER,
Instructor in Library Economy.

ADÈLE MILLICENT SMITH,
Instructor in Proof-reading.

CARL LEWIS ALTMAIER,
Instructor in Typewriting and Correspondence.

PRESIDENT MAC ALISTER lectures on the History of Books and Printing.

The Library School was organized in connection with the Library Department of the Institute in November, 1892, in order to furnish opportunities for the systematic training of librarians and assistants. The function of the library as an important part of the educational system of the country has become generally recognized. In consequence, the librarian's occupation is now considered a profession, and a special preparation for it a necessity. Graduates of training schools are able to advance more rapidly and to do their work with more satisfaction to themselves, as well as to others, because they have a systematic knowledge of the principles underlying the librarian's work.

The School offers a one year's course in library science. As the instruction is largely technical a good general

education on the part of the students is presupposed, a high-school education or its equivalent being a necessity. The broad educational side of the profession is also emphasized, while the literary part of the course is designed to assist the students in gaining the librarian's technical knowledge of books and authors, which can only be acquired by library methods. Graduates of the school are filling positions as librarians, cataloguers, or general assistants, in public, university, and school libraries.

Students are admitted only for the full course.

Certificates are granted to students who complete, satisfactorily, the full course of instruction.

COURSE OF INSTRUCTION

I. CATALOGUING

The instruction in cataloguing is based on the rules of the American Library Association. "The A. L. A. Rules" and Cutter's "Rules for a Dictionary Catalogue" are used as text-books. The instruction is supplemented by practical cataloguing under supervision. The preparation of finding lists and reference lists is also considered.

II. LIBRARY ECONOMY

Includes the following subjects: Library handwriting, accession and order work, classification, shelf-listing, alphabeting, mechanical preparation of books for the shelves, shelf-arrangement, care of periodicals and pamphlets, book-binding, charging-systems, stock-taking, supplies, statistics, proof-reading, typewriting.

ORDER DEPARTMENT.—Lectures on trade bibliography, on the selecting of books and the various processes and methods of ordering them, with practical exercises in selecting and ordering.

ACCESSION DEPARTMENT.—The Library School accession book rules are used as the basis of the instruction, with practical work in accessioning books.

CLASSIFICATION.—The Decimal classification is taught. Books are assigned for classification and discussed in class. Practical work for the library, under supervision. The Expansive and other systems of classification are described.

SHELF DEPARTMENT.—Shelf-listing by both methods (cards and sheets). Lectures on shelf-arrangement, stock-taking, and other details.

CIRCULATING DEPARTMENT.—Lectures on comparative methods of charging. Practical work at the charging desk of the Institute Library is required of each student. Lectures on access to shelves, information desks, rules and regulations.

BINDING, REBINDING, AND REPAIRING.—The most approved styles of library binding, the processes of binding, and directions for preparing books for the bindery. A visit to a bindery is made at the conclusion of the lectures. A brief outline of the history of bookbinding is also given.

III. STUDIES OF BOOKS AND AUTHORS

This course includes :

1. **PRACTICAL BIBLIOGRAPHICAL STUDIES** of a few representative American and English authors of the nineteenth century, an important feature of the studies being the reference work required of each student in the use of the resources of the library on the subject.
2. **SELECTION OF BOOKS.**—This work is based on the study of the "Publishers' Weekly" and some of the leading English and American critical reviews. Students are required to check each week, in the "Publishers' Weekly," the books considered desirable for certain specified types of libraries. This selection is criticised and discussed in class and a few of the most important publications are selected each week for more extended review and discussion.

IV. REFERENCE WORK AND BIBLIOGRAPHY

This subject includes the study of general encyclopedias, dictionaries, atlases, cyclopedias of special subjects, indexes and keys to periodicals and general literature, concordances, public documents, books and reading, general bibliography and bibliographies of special subjects. Practical questions are given to the students to be looked up in the reference books, with the object of showing how to obtain information on a subject quickly. "Guide to the study and use of reference books," by Alice B. Kroeger, is used as a text-book.

V. LIBRARY HISTORY AND EXTENSION

History of libraries, library associations and commissions, library buildings, library schools, traveling libraries, children's reading, and home libraries.

Study of current library history is made at a session of the class held fortnightly, to report on the various library periodicals, reports, bulletins, etc. Events are looked up also in the daily newspapers and periodicals.

VI. PRACTICAL WORK

In addition to the instruction and lectures, students are required to devote a certain amount of time to practical work, under supervision, in the Library of the Institute, and they serve during the year in all the departments of the Library.

Visits are made to the public libraries in Philadelphia and to the more important libraries in New York or Washington.

Each student, during the second term, prepares a bibliography or reference list on some subject approved by the Director.

VII. LECTURES

THE HISTORY OF BOOKS AND PRINTING.

A course of lectures by the President of the Institute, giving a comprehensive outline of the History of Books and Libraries, and the Rise and Development of Printing. The lectures embrace the following subjects:

- I. The Development of Language, Oral and Written. Ancient Systems of Writing. Derivation of the English Alphabet. The Preservation of Literature. Earliest Forms of Permanent Records. Literature, Books, and Libraries in the Ancient Civilizations of the East.
- II. The Literatures of Greece and Rome. The Book in the Classical Age. Alexandria as a Literary Centre. Barbarian Invasions of the Roman Empire. Decline and Extinction of Ancient Culture. Destruction of Books and Libraries.
- III. The Book in the Middle Age. The Preservation and the Production of Books in the Monasteries. Development of the Illuminated Manuscript. The Early Renaissance in its Relations to Literature and Books.
- IV. The Later Renaissance: Revival of Learning. Recovery of Ancient Literature. Rome, Florence, and Venice as the Centres of Activity. Multiplication of Manuscripts. The Formation of Modern Libraries.
- V. The Art of Engraving as the Precursor of Printing. The Invention and Diffusion of Printing. The Chief Centres and the Great Masters of Printing. The Printed Book and Its Influence upon Civilization.
- VI. Book Illustration in Ancient, Medieval, and Modern Times.
- VII. Books and Libraries in Europe and the United States. Types of Modern Public Libraries.
- VIII. Makers and Lovers of Books, and their Libraries.

PHYSICAL TRAINING

The students of the Library School have the privilege of attending the Institute classes in physical training without additional charge.

LANGUAGE COURSES

Evening courses in German, French, and Spanish are carried on under the auspices of the Associated Alumni of the Institute. The charge for tuition is six dollars for twenty lessons.

LIBRARY AND READING-ROOM

The Library contains thirty thousand volumes, and the Reading-room is supplied with one hundred and eighty periodicals.

Among the special collections of the Library are: the Anthony J. Drexel Bequest; the George W. Childs Collection of Manuscripts, presented by him to the Institute; the Charles H. Jarvis Memorial Library of Music; the George M. Standish Collection of general literature, including early printed books, illustrated books, fine editions of Italian and French writers, English books in art, literature, history, etc.; and the valuable and important works on art presented by Mr. James W. Paul and others.

ADMISSION

The entrance examination will be held Thursday, June 11th, 1903. The subjects include: (a) General literature; (b) a reading knowledge of French and German; (c) gen-

eral history and general information. As the number of students that can be admitted is limited to twenty, selection is made from those presenting the best examination papers, and showing special fitness for the course.

In the case of students unable to attend the examination held in Philadelphia, arrangements can be made for local examinations in places where there is a public or college library, provided the librarian is willing to undertake the conduct of the same. Notice must be given to the Director of the School in time to arrange for the local examinations.

In preparing for the entrance examinations, it is recommended that the applicant should give most attention to the study of literary history and criticism, and general history. Any good outline of these subjects will do as a basis for review. Vertical handwriting is used in most library records. It is therefore of great advantage to the student to have some proficiency in it before entering the School.

Sample entrance examination questions will be sent on application to the Director.

FEES

Full course, *twenty-five dollars* per term.

Students supply their own stationery and other materials, the cost of which is from fifteen to twenty dollars for the year.

TERMS

The full course extends from the first of October until the end of the calendar year, about the middle of June.

Applicants are not admitted to the School except at the beginning of the calendar year, in October.

There are two terms in the year, beginning, respectively, in October and February.

Attendance is required five days a week, from 9 a. m. to 4 p. m.

COURSES IN ENGLISH LANGUAGE AND LITERATURE

Open to Special Students

INSTRUCTORS

PROFESSOR HARRIET L. MASON in charge.

ALICE M. BRENNAN.

LILLIAN M. DALTON.

COURSE I.—PREPARATORY

Choice of words ; sentence construction ; punctuation ; social forms ; improprieties ; etymology ; composition work based upon reading.

Study of the "Idylls of the King" as a complete whole.

COURSE II.—RHETORIC

Synonyms ; diction ; phraseology ; style—force, life, emphasis, rapidity, smoothness ; the sentence ; the paragraph—its sum and structure.

Study of selected plays of Shakespeare. Composition work based upon the plays studied.

COURSE III.—PROSE STYLE

Studies of Bunyan, De Quincey, Burke, Thackeray, Ruskin, Lowell, Carlyle, Huxley, Newman, Arnold, Macaulay, Blackmore, Green, Hughes, Hawthorne, Scott, Mill, Tyn-dall, Morley, Addison, Curtis, Pater, Stevenson, Hewlett, and Hearn, with a view to illustrating the style and invention of representative authors.

COURSE IV.—PARAGRAPH WRITING

General laws of the paragraph ; the isolated paragraph—development by repetition, definition, contrast, explanation, cause and effect, proofs, combination of two or more methods ; use of sentence types ; ordering of material ; scale of treatment. This course gives constant practice in off-hand writing, and is intended to train the student in the rapid expression of his thoughts. All the writing is done in the class. The course may be followed by courses in Expository and Argumentative Writing, as soon as the student develops sufficient power.

COURSE V.—AMERICAN LITERATURE

This course aims to give a continuous development of American literature up to the present time. Syllabuses are given out, which contain references to authors. These the student reads, and at the recitation gives the result of his reading and is led by questioning to see and feel the characteristics of the authors. In this way, he is trained to make deductions for himself, to know books, and to appreciate literature.

COURSE VI.—ENGLISH LITERATURE

This course gives a development of English literature from the Anglo-Saxon age to the present time. The syllabuses used contain references to historical matter that serves as a background, to imaginative literature that clothes the period, and to selections of original writings or to the originals themselves. The Library of the Institute

192 COURSES IN ENGLISH LANGUAGE AND LITERATURE

offers opportunities to give a completeness to this course, which otherwise only a college library would make possible.

COURSE VII.—MAJOR VICTORIAN POETS

Studies of Robert Browning, Alfred Tennyson, Matthew Arnold, Algernon Swinburne, with a view to an appreciation of their work, their relation to their times, and their part in the development of English poetry.

COURSE VIII.—THE ROSSETTIS AND THE POETS OF THE YOUNGER GENERATION

Studies of Dante Gabriel Rossetti, Christina Rossetti, Rudyard Kipling, Stephen Phillips, Henry Newbolt, William Watson, William Butler Yeats.

Courses VII and VIII are given in alternate years.

Course VIII will be given in 1903-04.

ADMISSION

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Any one of the courses, *ten dollars* per term; any two of the courses, *twenty dollars* per term; any three of the courses, *twenty-five dollars* per term.

There are two terms in the year, beginning, respectively, in September and February.

COURSES IN ENGLISH LANGUAGE AND LITERATURE 193

EVENING CLASSES

From the beginning of October until the end of March, courses in English Language and Literature are open to students in the evening, full information concerning which will be found on page 236.

DEPARTMENT OF PHYSICAL TRAINING

MAUDE G. HOPKINS,
J. PETERSON RYDER, S. B., } Directors.

The Department of Physical Training has been organized for the purpose of furnishing thorough and systematic physical education. The training begins with simple exercises and gradually leads to more complex movements, the aim throughout being the harmonious development of the bodily powers in their relation to sound mental action. The methods of training are founded on physiological and hygienic principles, and are in accordance with the teachings of the highest authorities on physical education. From first to last, the object kept in view is the cultivation of a healthy physique rather than gymnastic feats.

The Gymnasium is a large, well-lighted, and well-ventilated hall, and is unsurpassed in the completeness of its appointments. The apparatus was designed and constructed under the immediate direction of Dr. Edward M. Hartwell, formerly Director of Physical Training in the Boston Public Schools. In connection with the Gymnasium there are dressing-rooms and separate suites of finely appointed marble baths, with hot and cold water, for men and women.

SPECIAL CLASSES

The Gymnasium is intended primarily for the physical training of the students connected with the several depart-

ments of the Institute, but special classes are conducted as follows :

SPECIAL CLASSES FOR LADIES

MORNING CLASS (Advanced).—Two days per week, at ten o'clock. Monday and Thursday.

AFTERNOON CLASS (Beginners).—Two days per week, at 2.45 o'clock. Monday and Thursday.

FENCING CLASS FOR LADIES

SATURDAY MORNING, at ten o'clock. The class is conducted by Mr. Ryder.

CHILDREN'S CLASSES

There are also Special Classes for Children :

Two days per week, at 4.15 p. m. Monday and Thursday.

The Directors exercise immediate supervision over all the class work and the use of the baths.

The members of all the classes are required to provide themselves with a suitable gymnastic dress.

TERMS

The arrangements for the terms are as follows :

1. **INSTITUTE CLASSES** begin as soon as practicable after the opening of the academic year in September and continue until the close of the year.

2. **SPECIAL CLASSES FOR LADIES**, one term of six months, begin November 1st and continue until May 1st.

3. SATURDAY MORNING FENCING CLASS, one term of six months, begins November 1st and continues until May 1st.

4. SPECIAL CLASSES FOR CHILDREN, one term of six months, begin November 1st and continue until May 1st.

5. SPECIAL STUDENTS (ladies) desirous of devoting more time to the training may attend for two terms of four months each, the first term beginning October 1st and the second term February 1st.

ADMISSION

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

Directors' office hours :

Miss Hopkins—one to two, daily, except on Saturdays.

Mr. Ryder—at four o'clock, daily, except on Saturdays.

FEEs

SPECIAL CLASSES FOR LADIES, one term of six months, *fifteen dollars* ; two terms, of four months each, *ten dollars* per term.

SATURDAY MORNING FENCING CLASS, one term of six months, *eight dollars*.

CHILDREN'S CLASSES, one term of six months, *fifteen dollars*.

A deposit of *fifty cents* per term is required as security for the return of the locker-key.

LECTURES ON ANATOMY AND PHYSIOLOGY

The lectures on Anatomy and Physiology, which are given in the Department of Domestic Science by Dr. A.

P. Brubaker, are open to special students and to such other persons as may desire to attend them. These lectures are of special value in themselves, aside from their bearing upon physical well-being.

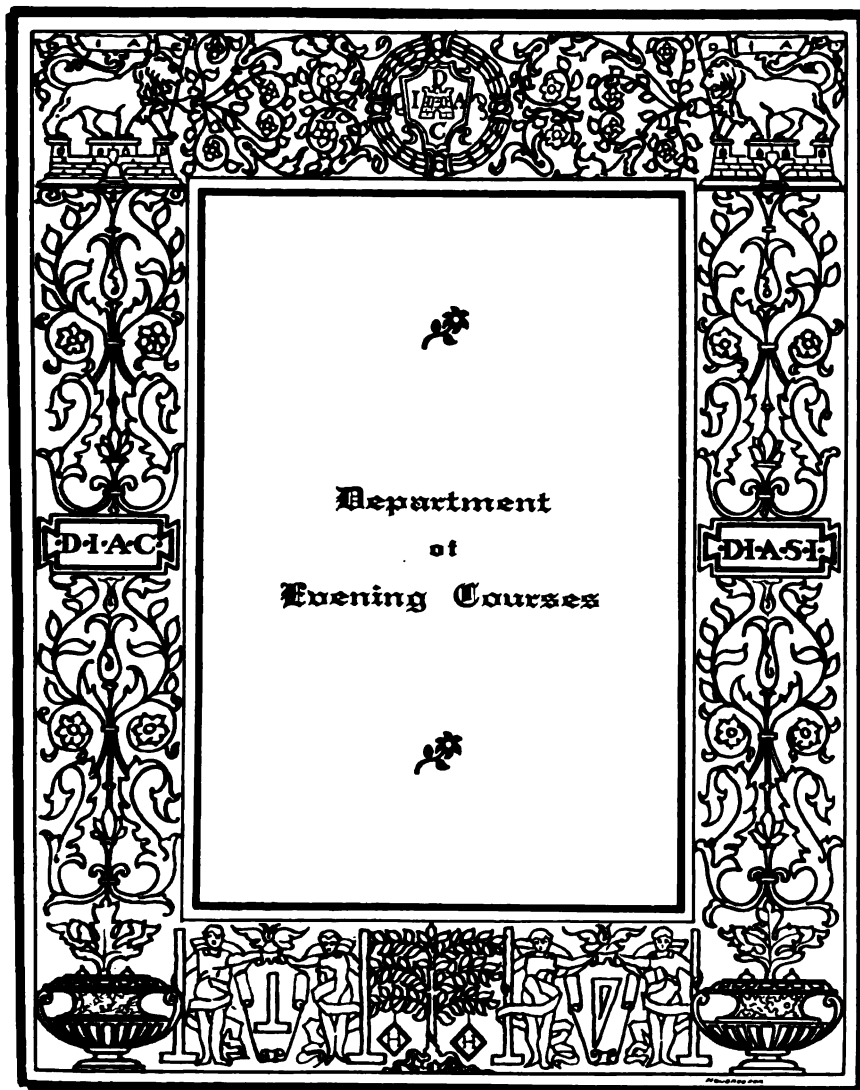
The course of instruction embraces both lectures and demonstrations. The lectures cover the following topics: the general plan of organization of the human body; the physical and chemical properties of the tissues; the chemical composition and the physiological properties of foods and their relative values as nutritive agents; the general process of digestion; the elaboration of food into blood; the circulation of the blood, respiration, animal heat; secretion and excretion; the physiology of the nervous system and special senses with reference to the lectures on psychology. The laboratory demonstrations have reference to the above course of lectures. Lectures are given also embracing the subjects of physical development, physical training, the effects of diet, the care of the skin, clothing, ventilation, household sanitation, emergencies, and similar hygienic topics.

During the Senior Year, the laboratory work includes the following topics: the chemical relation of starch, sugar, fat, and proteids; the determination of the heat values of food; the process of fermentation; the cultivation of micro-organisms and their relation to disease; dissections of different animal forms generally used as foods. The lectures embrace the following topics: ptomaines and leucomaines of foods and their influence in the production of disease; the parasites usually associated with animal foods; diseases of nutrition, such as gout, diabetes, rickets, scurvy, and rheumatism.

An additional fee of *ten dollars* per term is charged for the first course, and of *five dollars* per term for the second course.

EVENING CLASSES

Separate Evening Classes for young men and young women are provided during the winter months. The fee for each class is *three dollars* for the session of six months. Full information concerning these classes is given on page 237.



100

DEPARTMENT OF EVENING COURSES

There is a separate circular for each of the courses named below.

I. ART COURSES

Free-hand Drawing.
Drawing from the Antique.
Life.
Clay Modeling.
Wood-Carving.

II. ARCHITECTURAL COURSES

Architectural Drawing.
Architectural Design.
House Construction Drawing.
Building Construction.
Pen and Ink Rendering.
Water-Color Rendering.

III. SCIENCE COURSES

Mathematics.
Physics.
Chemistry.

IV. ELECTRICAL ENGINEERING SUBJECTS

Applied Electricity.
Engineering Electricity.
Telephony.
Telegraphy.

Dynamo Design.
Alternating Current Engineering.
Electric Light Engineering.

V. MECHANICAL ENGINEERING SUBJECTS

Strength of Materials and Applied Mechanics.
Steam-Engines and Boilers.
Design of Machine Elements and Power Transmission
Devices.
Advanced Machine Design.

VI. MECHANICAL DRAWING

VII. SHOPWORK

Woodworking.
Benchwork in Iron.
Machine Construction.
Forging.

VIII. COMMERCIAL COURSES

Bookkeeping, Commercial Arithmetic, and Penmanship.
Stenography and Typewriting.

IX. DOMESTIC SCIENCE

Cookery—two consecutive courses.

X. DOMESTIC ARTS

Dressmaking.
Millinery.
Sewing—hand and machine sewing, and the making of
simple garments.

XI. ENGLISH LANGUAGE AND LITERATURE

Three consecutive courses in Composition, Rhetoric,
and American and English Literature.

XII. PHYSICAL TRAINING

XIII. CHORAL MUSIC

The Choral Class.

The Drexel Chorus.

DEPARTMENT OF EVENING COURSES

ART COURSES

I. **FREE-HAND DRAWING.**—Monday and Wednesday evenings, at 7.30. MARY E. FRATZ, Instructor. Fee, *five dollars*.

II. **DRAWING FROM THE ANTIQUE.**—Tuesday and Thursday evenings, at 7.30. JAMES L. WOOD, Instructor. Fee, *five dollars*.

III. **WOOD-CARVING.**—Ornament of various kinds; carved enrichments for furniture; frames; architectural decorations, etc. Tuesday and Thursday evenings, at 7.30. JOHN TODD HILL, Instructor. Fee, *five dollars*.

IV. **CLAY MODELING: ELEMENTARY AND LIFE CLASSES.**—Monday and Wednesday evenings, at 7.30. JOHN TODD HILL, Instructor. Fee, *five dollars*.

V. **LIFE CLASS.**—For men, Tuesday, Thursday, and Friday; for women, Monday and Wednesday; from 7 to 10 p. m. JAMES L. WOOD, Instructor. Fee, *seven dollars*.

ARCHITECTURAL COURSES

- I. COURSE IN ARCHITECTURAL DRAWING.
- II. COURSE IN ARCHITECTURAL DESIGN.
- III. COURSE IN HOUSE CONSTRUCTION DRAWING.
- IV. COURSE IN BUILDING CONSTRUCTION.
- V. COURSE IN PEN AND INK RENDERING.
- VI. COURSE IN WATER-COLOR RENDERING.

These courses are intended primarily for the training of special expert architectural assistants, and are arranged with that end in view, each class being in charge of a professor or instructor especially adapted to the work and actively engaged in daily professional practice. The training is of such a character that students engaged in the allied arts of decoration, architectural sculpture, etc., may profit by the instruction.

PREPARATORY CLASS.—For students who have not had the requisite preparatory training in mechanical drawing.

The work of this class is the study of sections and projections, with special reference to the work in the Architectural Drawing and House Construction Drawing Classes, the object being to give students a thorough training in practical draftsmanship.

I. COURSE IN ARCHITECTURAL DRAWING. PROFESSOR JOHN J. DULL in charge. EDWARD P. SIMON, Instructor. Tuesday and Thursday evenings, at 7.30.

The full course, leading to a graduate certificate, occupies two sessions (years). The work is divided as follows:

First Year.—The mechanical projection of shades and shadows, and the theory of light and shade work with the making of wash drawings in monotone for practice; followed by lectures on perspective, and the making of practical architectural perspective drawings from plans and elevations, isometric projections being given as special work.

Second Year.—The classic orders: their principles and proportions, and the theory and uses of their various moldings and parts; the making of wash drawings in mono-

tone, of the same, with cast shadows, for practice; followed by lectures on the development of the architectural styles, and the drawing of the distinctive ornamental work of these styles.

Examinations are held in the middle and at the end of each session, to determine the standing and progress of the students.

Requirements for Admission.—Applicants must submit drawings which are of sufficient merit to satisfy the professor in charge that they can profit by the instruction.

Fees.—First year, *five dollars*; second year, *seven dollars*.

II. COURSE IN ARCHITECTURAL DESIGN. PROFESSOR JOHN J. DULL in charge. Tuesday and Thursday evenings, at 7.30.

The work of this course consists of a series of problems in design, with a critical review of the work at the completion of each problem.

Requirements for Admission.—Applicants who have obtained the certificate of the Class in Architectural Drawing are admitted without further examination. Other applicants are received on the approval of the professor in charge.

Fee, six dollars.

III. COURSE IN HOUSE CONSTRUCTION DRAWING. PROFESSOR JOHN J. DULL in charge. EDWARD P. SIMON, Instructor. Tuesday and Thursday evenings, at 7.30.

Students in this class must have taken one full session in the Preparatory Class, or have a knowledge of drawing, the equivalent thereof.

The work includes the drawing of plans, elevations, details of construction work, and the study of specifications.

Lectures on plumbing, heating, and lighting are given in connection with the work on specifications.

Examinations are held in the middle and at the end of each session.

Requirements for Admission.—Same as for the Architectural Drawing Class.

Fee, *six dollars*.

IV. COURSE IN BUILDING CONSTRUCTION. PROFESSOR HOWARD S. RICHARDS, B. S., in charge. EDWIN CLARK, Instructor.

This course offers to persons engaged during the day opportunity for the theoretical and practical study of the architectural and engineering problems involved in building construction, similar to that of the regular day classes, the only difference being the length of time which can be devoted to the work. All the resources of the department are brought into requisition, and the instruction is carried as far as the attainments and application of the students warrant.

The full course, leading to a graduate certificate, occupies two sessions, of six months each, but students are admitted for a single session to either of the classes for which they have the necessary preparation.

The preparation in mathematics and mechanical drawing required for admission to the course is furnished by the evening classes in these subjects.

The course is arranged as follows:

First-Year Class.—Wednesday evening, at 7.30. Lectures on the strength of building materials, investigation and calculation of the strength of tension members, compression members, beams, plate-girders, foundations, etc. Graphic analysis of the stresses in the ordinary forms of roof-trusses. Calculation of the weights of materials and of the usual loads upon floors, roofs, etc.

Second-Year Class.—Saturday afternoon, 2 to 5. Lectures on the design of structural parts and the best and most economical forms of construction. Advanced calculations. Design and detail of complete constructions. Specifications.

Drawing and Testing Class.—Monday evening, at 7.30. For both the First-year and the Second-year Class. Drawing of details of foundations, columns, roof-trusses, joints in wood and steel construction, timber work, riveted steel work, pin-connected work, and all kinds of structural detail. Testing of strength of stone, brick, and cement; also tension, compression, and transverse tests of steel and timber, and of the various combinations used in building construction.

Equipment.—The Institute is equipped with all appliances for making these tests in the latest and most approved manner, including a 200,000-pound Olsen Automatic and Autographic Machine and a Standard Cement Tester.

Certificate.—In order to obtain a graduate certificate, a student must complete the full course of two years and must prepare, as a thesis, the design and detail of a satisfactory piece of construction.

Requirements for Admission.—For admission to the First-year Class, a knowledge of Elementary Mathematics (Al-

gebra and Plane Geometry) and Mechanical Drawing is required; to the Second-year class, a knowledge of the subjects embraced in the First-year Class.

Fees.—First-year Class, *six dollars*; Second-year Class, *seven dollars*.

V. COURSE IN PEN AND INK RENDERING. PROFESSOR ARTHUR TRUSCOTT, Instructor. Friday evening, at 7.30.

The full course, leading to a certificate, occupies one session.

The work in this class is devoted primarily to architectural subjects, the rendering of buildings and accessories. Attention at the same time is given to all classes of illustrative work, so that students may, if they so desire, pursue a course in broader fields of illustration.

Requirements for Admission.—A sufficient knowledge of drawing to satisfy the professor in charge that the student can profit by the instruction. Drawings must be submitted.

Fee.—*Seven dollars* per session.

VI. COURSE IN WATER-COLOR RENDERING. PROFESSOR JOHN J. DULL, Instructor. Saturday, at 2.30 p. m.

If found more convenient, the class will meet on some evening, other than Saturday, at 7.30.

The Water-Color Class aims to furnish the architectural draftsman with one of the most valuable qualifications for architectural work—the effective, strong, and rapid rendering in color of perspectives and architectural subjects.

Requirements for Admission.—The same as for the Course in Pen and Ink Rendering.

Fee.—Six dollars per session.

In all the Architectural Drawing Classes the instruction is largely individual, and students showing special aptitude for the work are advanced as rapidly as their attainments permit.

Equipment.—The Institute is thoroughly equipped with the appliances necessary for carrying on the work, including a collection of architectural casts, models of interior construction and finish, etc., etc.

Of the special drawing equipment necessary to each student, the Institute furnishes drawing-boards only. Students supply themselves with drawing instruments, paper, etc. In connection with the Institute there is a supply-store where these articles can be obtained. Lockers are provided for instruments, etc. A deposit of *fifty cents* is required as security for the return of the locker-key.

Library and Reading-room.—The Library contains an extensive collection of valuable and important books on architecture. There is also an extensive collection of architectural photographs, to which additions are constantly made.

The Reading-room is supplied with the leading architectural periodicals.

A Special Reference Library and Reading-room, communicating with the classrooms, is provided for the use of the Architectural Classes.

SCIENCE COURSES

MATHEMATICS

PROFESSOR CHARLES H. WHEELER, Ph. B. KATHARINE D. BROWN, B. S., GEORGE A. HUGGINS, Instructors.

COURSE I. BEGINNERS COURSE IN ALGEBRA AND GEOMETRY, embracing fractions, involution, evolution, simultaneous equations of the first degree in algebra; the straight line, circle, and original exercises in geometry.

Algebra, Tuesday. Geometry, Thursday. Fee, *five dollars*. Requires previous knowledge of arithmetic.

COURSE II. ALGEBRA AND GEOMETRY, embracing theory of exponents, quadratic equations, proportion, the progressions, logarithms in algebra; the completion of plane geometry.

Algebra, Monday. Geometry, Wednesday. Fee, *five dollars*. Requires previous knowledge of Course I.

COURSE III. PLANE TRIGONOMETRY, embracing the solution of right and oblique triangles, trigonometrical identities and equations, and a variety of practical problems in heights and distances.

Wednesday. Fee, *five dollars*. Requires previous knowledge of Courses I. and II.

COURSE IV. PRACTICAL CALCULUS FOR ENGINEERS. An elementary course in the essentials of calculus and analytical geometry for engineers, requiring only a knowledge of

Courses II. and III. Whatever knowledge of analytics may be required for calculus is given in connection with the calculus.

Tuesday. Fee, *seven dollars*.

COURSE V. MECHANICS.—The elements of theoretical mechanics with application to many practical problems.

Monday. Fee, *five dollars*. Requires previous knowledge of Courses II. and III.

A deduction is made in the fee when two courses are taken at the same time.

A certificate is granted to students who finish the first four courses, or Courses I., II., III., and V.

Students furnish their own text-books.

PHYSICS

PROFESSOR WILLIAM L. BAILIE, LIEUT. U. S. N.

LECTURES AND LABORATORY COURSE, WITH RECITATIONS.—The course is more especially intended for students who are preparing for the evening courses in Electrical and Mechanical Engineering Subjects, for which some knowledge of Physics is necessary. One lecture a week is given throughout the session, in the principles and laws of the science, which are explained by suitable experiments. Two hours a week are devoted to laboratory work, for the purpose of familiarizing the student with the apparatus, methods of experimentation, and the logical deductions therefrom.

The subject of Mechanics receives careful treatment, inasmuch as it is the foundation of the subsequent work.

The laboratory work admits of the use of simple apparatus, and, to a large extent, is illustrative of the lectures.

Tuesday and Thursday. Fee, *ten dollars*.

A deposit of *three dollars*, as security against breakage of apparatus, is required of each student in Physics. This is returned at the close of the session, less the cost of the apparatus injured.

CHEMISTRY

COURSE I. GENERAL CHEMISTRY.—Lectures and laboratory work. Monday and Thursday. PROFESSOR ERNEST A. CONGDON, Ph. B. FREDERICK L. LEWTON, Instructor. Fee, *five dollars*.

COURSE II. ELEMENTS OF QUALITATIVE ANALYSIS.—Laboratory work. Monday and Thursday. PROFESSOR ERNEST A. CONGDON, Ph. B. FREDERICK L. LEWTON, Instructor. Fee, *six dollars*.

COURSE III. ELEMENTS OF QUANTITATIVE ANALYSIS.—Laboratory work. Tuesday and Wednesday. ABRAHAM HENWOOD, B. S., Instructor. Fee, *seven dollars*.

COURSE IV. ADVANCED QUANTITATIVE ANALYSIS.—Laboratory work. Tuesday and Wednesday. ABRAHAM HENWOOD, B. S., Instructor. Fee, *seven dollars*.

COURSE V. TECHNICAL ANALYSIS.—Tuesday and Wednesday. ABRAHAM HENWOOD, B. S., Instructor. Fee, *seven dollars*.

This course is designed for advanced students who desire to fit themselves for dealing with the practical problems of

engineering chemistry. The course embraces the following subjects :

Fuel.—Proximate analysis of coal ; moisture, volatile matter, coke, ash, and sulphur. Specific gravity and calorific value.

Gas.—Determinations of carbon di-oxide, oxygen, carbon monoxide, hydrogen and nitrogen, employing the Elliot, Fisher-Orsat, and Hempel forms of apparatus.

Water.—Total solid matter, temporary and permanent hardness, chlorides, sulphates, nitrates, also silica, iron oxide, alumina, lime, magnesia, potash, and soda.

Lubricating Oil.—Specific gravity, viscosity, cold tests, flashing point, loss in weight on exposure to elevated temperatures, tendency to oxidize and gum, percentage of mineral and of fatty oil, free fatty acid, free mineral acid, suspended matters, rosin oil.

A deposit of *three dollars*, as security against breakage, is required of students in the Chemistry classes. This is returned at the close of the session, less the cost of the apparatus destroyed. A deposit of *fifty cents* is required also as security for the return of the locker-key.

COURSES IN ELECTRICAL AND MECHANICAL ENGINEERING SUBJECTS

The following Evening Courses in Electrical and Mechanical Engineering Subjects are offered for those unable to avail themselves of the more advanced and systematic work of the day classes. The instruction is given by the regular staff of teachers, or by specialists actively engaged in directing the operations covered by the respective courses.

CLASSROOMS AND LABORATORIES

THE ENGINEERING CLASSROOMS AND LABORATORIES are located on the ground and first floors of East Hall, entrance to which is through the Main Building. Students attending the evening classes have the use of the same extensive appliances for instruction as the day students.

THE ELECTRICAL LABORATORIES are equipped with a complete outfit of modern electrical machinery and testing apparatus. The Dynamo Laboratories contain examples of nearly all types of D. C. and A. C. dynamos and motors in use ; of arc and incandescent lamps ; of transformers, and all proper instruments for making tests of them. The dynamos are operated through a counter-shaft by a seventy-five horse-power Porter-Allen engine, or a motor, as may be required. Current is distributed through an elaborate system of laboratory switchboards.

The Galvanometer Laboratory is well equipped for the general work of Courses I and II, as well as for the special work of Courses III and IV. Among the apparatus and

instruments available are resistance boxes, condensers, galvanometers, wheatstone bridges, voltameters, and a variety of special devices to facilitate experimental work. There are also examples of the standard and the most recent telegraph and telephone apparatus.

MECHANICAL LABORATORIES.—The equipment of the Mechanical Laboratories is ample, including a Porter-Allen seventy-five horse-power engine; a Corliss engine of fifty horse-power; and an Armington & Sims double-vertical twenty horse-power engine. Conspicuous among the gauges, thermometers, indicators, and other instruments usually found in mechanical laboratories, is a 200,000 pound testing-machine, built by Tinius Olsen, which is arranged for tensile, compressive, and transverse tests.

The extensive power-plant of the Institute is available, also, for practice in engine indicating, and in steam-engine and boiler testing.

THE DRAWING-ROOM for Work in Machine Design is a large and well-lighted room, provided with convenient desks, and with separate drawers for tools, materials, and text-books. There is a fine collection of blue-prints, photographs, drawings, trade catalogues, and engineering reference books for the use of the students.

ADMISSION

On the evenings of September 28th, 29th, and 30th, October 1st and 2nd, and on Saturday afternoon, October 3d, Professor Rowland (Electrical Engineering) and Professor Bruegel (Mechanical Engineering) will be at the Institute for the purpose of conferring with persons intending to enter the courses. As the number of applicants is usually in excess of the number that can be received, early

application is advisable. Application forms may be obtained from the Registrar, filled out at any time in advance of the above dates, and sent to the Registrar's office.

FEES AND EXPENSES

The fees for the several courses are given in their respective places. For some courses, a deposit of *five dollars* is required, as security against breakage of apparatus. This is returned at the close of the session, less the cost of the apparatus injured or destroyed.

Students supply their own text-books, drawing instruments and materials, and note-books. Syllabuses and outlines to accompany the various courses are supplied to the students at a nominal price.

ELECTRICAL ENGINEERING SUBJECTS

PROFESSOR ARTHUR J. ROWLAND in charge. WILLIAM B. CREAGMILE, CHARLES E. BONINE, WILLIAM D. FORSTER, GEORGE A. PIERCE, LEO D. FIRMAN, Instructors.

Admission to each of the Electrical Courses is by written examination, or on presentation of satisfactory credentials. The evenings for examination are : Arithmetic and Mathematics, Monday, October 5th; Physics and Electricity, Tuesday, October 6th.

The following courses are offered :

- I. APPLIED ELECTRICITY.
- II. ENGINEERING ELECTRICITY.
- III. TELEPHONY,
- IV. TELEGRAPHY.
- V. DYNAMO DESIGN.
- VI. ALTERNATING CURRENT ENGINEERING.
- VII. ELECTRIC LIGHT ENGINEERING.

COURSE I. APPLIED ELECTRICITY

The course embraces the Simple Theory of the Electric Circuit and its common applications in lighting and power distribution, etc., with laboratory work in testing.

This course is intended for men who have not the time to devote to the study of physics and mathematics, and is designed to give a knowledge of the principles regulating the flow of current in an electric circuit and the application of these to systems in common use for lighting and power distribution. The special purpose of the course is to prepare the student to handle electrical machinery and circuits with intelligence.

At the beginning of the session some time is given to Mensuration, Algebraic forms, and simple mechanical problems. The electrical work starts with primary and secondary batteries, dynamos, motors, incandescent and arc lamps; this is followed by an elementary study of alternating current principles.

The course extends through one session of six months.

The class meets two evenings a week, at 7.30: on Monday for lectures and recitations; for laboratory work on such other evening as may be selected. Each student is entitled to one evening of laboratory work a week.

An examination for admission is required in simple Arithmetic, including mixed numbers, decimals, percentage, and proportion.

Fee for the session, *ten dollars*.

Each student is required to make a deposit of *five dollars*, as security against injury to apparatus. This is returned at the close of the session, less the cost of the apparatus injured or destroyed.

COURSE II. ENGINEERING ELECTRICITY

A systematic course of two sessions, embracing lectures on the Theory and Practical Application of Continuous and Alternating Currents. The electrical measurements and tests used in general engineering work are made in the laboratories.

The work of this course is intended to furnish to men, unable to attend the regular Electrical Engineering Course of the day classes, opportunities to study the same topics as are presented in a high-grade scientific course in electricity. Those who already have some elementary knowledge of the subject are best able to pursue the work. Recent graduates from the Philadelphia Manual Training Schools, or from schools of equal grade, are received without examination. Other applicants must have a knowledge of Laboratory Physics, Elementary Algebra, Plane Geometry, and Plane Trigonometry, at least equivalent to that given in the various courses dealing with these subjects in the Drexel Institute evening classes. Proficiency in these subjects is determined by examination. Applicants for admission who have not studied Trigonometry may take up that subject in the regular evening classes of the Institute, while pursuing the first year's work of the course.

The course extends through two sessions of six months each.

In the first year of the course, Tuesday is devoted to class-work; in the second year, Friday. The laboratory work of both years is done on such other evenings as may be selected. Each student is entitled to one laboratory evening a week.

Fee for the session, *ten dollars*.

Each student is required to make a deposit of *five dollars*, as security against breakage of apparatus. This is returned at the close of the session, less the cost of the apparatus injured or destroyed.

COURSE III. TELEPHONY

WILLIAM D. FORSTER, Instructor.

This course includes the general range of telephone work, and is not confined to the methods and apparatus of any one company. It is thoroughly practical and is intended to be of special value to men already engaged in telephone work. The laboratory training is largely individual. Experiments to illustrate principles, the connections of apparatus, and the tests made on lines and cables are assigned to the student.

The course extends through the session of six months.

The class meets on Monday and Thursday evenings, at 7.30.

The requirements for admission are the same as for Course I.

Fee for the session, *ten dollars*.

Each student is required to make a deposit of *five dollars*, as security against breakage of apparatus. This is returned at the close of the session, less the cost of the apparatus injured or destroyed.

COURSE IV. TELEGRAPHY

LEO D. FIRMAN, Instructor.

The instruction includes principles as well as practice. The scope of work is determined by the fitness of the men who enter the class. The laboratory training covers the

theoretical principles involved as well as the use and management of the instruments of each system, and the adjustments and tests which are made in telegraph engineering.

The course extends through the session of six months.

The class meets on Monday and Wednesday evenings, at 7.30.

The requirements for admission are the same as for Course I.

Fee for the session, *ten dollars*.

Each student is required to make a deposit of *five dollars*, as security against breakage of apparatus. This is returned at the close of the session, less the cost of the apparatus injured or destroyed.

COURSE V. DYNAMO DESIGN

CHARLES E. BONINE, Lecturer.

A course of twelve lectures, dealing with the practical side of Direct Current Machine Design. The work is intended to give an outline of the application of theory to practical dynamo and motor calculation and to familiarize the student with the general order of procedure and the criteria of good design, including methods of planning machines to meet specifications.

The lectures are illustrated by examples of materials used, and, so far as practicable, by parts of machinery of special interest on which some work has been done.

One lecture a week is given, beginning at the opening of the session.

For admission, previous knowledge of Course II or its equivalent is required.

Fee for the course, *five dollars*.

COURSE VI. ALTERNATING CURRENT ENGINEERING

ARTHUR J. ROWLAND, Lecturer.

A course of twelve lectures, dealing mainly with Poly-phase Alternating Current Apparatus and problems connected with distributing circuits. Dynamo, transformer, and line design are discussed in their relation to problems of distribution. The work is a continuation of the Alternating Current work of Course II.

One lecture a week is given, beginning after the Christmas holidays.

For admission, previous knowledge of Course II or its equivalent is required.

Fee for the course, *five dollars*.

COURSE VII. ELECTRIC LIGHT ENGINEERING

A course of twelve lectures, dealing with different lights and systems of lighting, with reference to their characteristic features, relative value, and cost. Other subjects, such as methods of installing wiring, load factor, all-day efficiency, and choice of generating units, are discussed. Examples are given of specification and contract forms.

One lecture a week is given, beginning at the opening of the session.

For admission, previous knowledge of Course II or its equivalent is required.

Fee for the course, *five dollars*.

Students may take Courses V, VI, and VII together, with a certain amount of laboratory work, in which case the fee is *ten dollars*.

MECHANICAL ENGINEERING SUBJECTS

PROFESSOR A. THEODORE BRUEGEL in charge.

The following courses are offered :

- I. THE STRENGTH OF MATERIALS AND APPLIED MECHANICS.
- II. STEAM-ENGINES AND BOILERS.
- III. DESIGN OF MACHINE ELEMENTS AND POWER TRANSMISSION DEVICES.
- IV. ADVANCED MACHINE DESIGN.

COURSE I. THE STRENGTH OF MATERIALS AND APPLIED MECHANICS

The instruction is by recitations and lectures, supplemented by laboratory experiments. It comprises a study of the fundamental principles of applied mechanics and their application in the investigation of the strength of materials, a brief discussion of the physical properties of the materials of construction, and numerous applications to practical problems. It includes also the making of laboratory tests of rods, beams, columns, shafts, cements, etc., for tension, compression, and transverse strength ; for deflection ; and for shearing and torsional resistance.

Among the subjects dealt with are : Work and energy ; friction and lost work ; dynamics of simple machines ; resolution of forces ; graphical analysis of stresses ; moments of forces ; inertia stresses ; moments of inertia ; stress and strain ; elastic and ultimate strength ; methods of testing ; bending moments ; centre of gravity ; calculation of stresses in beams and in the simpler framed structures ; power transmission of shafts ; formulas used in design with practical applications ; study of stresses due to change in tempera-

ture and to impact loads ; safe loads for columns ; outline of metallurgy of iron and steel ; effects of slight variation in composition upon the physical properties ; effects of mechanical treatment and of heat ; woods ; alloys ; and considerations affecting the selection of a material.

The course extends through the session of six months.

The class meets on Tuesday and Friday evenings, at 7.30.

For admission, the applicant must satisfy the professor in charge that he can satisfactorily carry on the work. It is important that those desiring to enter should present themselves at as early a date as possible, as the number that can be received is limited.

Fee for the course, *ten dollars*.

II. STEAM-ENGINE AND BOILERS

The instruction in Steam-Engine and Boilers is by lectures, recitations, and practical laboratory practice. It includes : the study of heat and its relation to work ; the properties of steam ; the combustion and evaporative power of fuels ; indicator diagrams and the determination therefrom of horse-power, steam consumption, and cylinder condensation ; economy of steam-jacketing and of superheating ; valve adjustment ; types of engines ; condensers ; the plain slide-valve, piston, and double-ported valves ; link motions ; Corliss and other valve-gears ; valve diagrams ; engine details ; shaft-couplings ; calculation of tangential pressure on crank-pin and other stresses ; Watt, Porter, and shaft governors ; fly-wheels.

The subject of Boilers includes : types of boilers—shell, water-tube, fire-tube, locomotive, marine ; heating surface and grate surface ; staying and other details ; settings ;

safety-valves ; computation of stresses ; boiler performance and efficiency.

The laboratory exercises include the study and use of different makes of indicators in the "indicating" of steam-engines ; forms of reducing motions ; calculation from the card of horse-power and weight of steam used ; valve-setting by measurement and by indicator card ; measurement of power delivered ; measurement of moisture in steam ; testing indicator springs and steam-gauges ; efficiency test of engines and boilers.

The course extends through the session of six months.

The class meets on Monday and Wednesday evenings, at 7.30.

For admission the requirements are the same as for Course I.

Fee for the course, *ten dollars*.

COURSE III. DESIGN OF MACHINE ELEMENTS AND POWER TRANSMISSION DEVICES

This course aims to start the student in the actual designing of machinery. It presupposes a knowledge of mechanical drawing. It begins with the application of the principles of mechanism and strength of materials to machine elements and power transmission devices and includes the various means of communicating motion ; velocity ratios ; problems in the laying out of cams ; correct tooth forms ; parallel motions ; quick-return linkages ; pulleys and belting ; trains of gearing ; journals and bearings ; shafts, couplings, and hangers ; pipes and fittings ; hydraulic cylinders and riveted joints ; the designing of jib-cranes, machine details, and simple machines.

The instruction is largely individual, and mainly over the drawing-board.

The course extends through the session of six months.

The class meets on Monday and Wednesday evenings, at 7.30.

For admission to this class, the student must have a fair knowledge of mechanical drawing and elementary mathematics. No formal examination is required, but the applicant must personally satisfy the professor in charge that he can satisfactorily carry on the work. The student who has not had the equivalent of the course in the Strength of Materials and Applied Mechanics, will find it greatly to his advantage to take that course at the same time.

Fee for the course, *ten dollars*.

COURSE IV. ADVANCED MACHINE DESIGN

The course is intended for those who have already had some training in machine design. It presupposes a knowledge of the fundamental principles of Applied Mechanics and Strength of Materials, and the ability to make an acceptable working drawing. It includes the design, in whole or in part, of machine tools, hoisting and conveying machinery, hydraulic presses, pumps, boilers, steam-engines, and auxiliaries. For the design of steam machinery, a knowledge of the course in Steam-Engine and Boilers, or equivalent preparation, is required. With a sufficient number of properly qualified applicants, a class will be formed in the design of marine machinery, under a specialist in this branch.

The work is largely individual, and more extensive than can be accomplished in one session, but each student will

be assigned problems suited to his preparation and, so far as possible, in line with his desire for specialization.

The course extends through the session of six months.

The class meets on Tuesday and Friday evenings, at 7.30.

For admission, the applicant must satisfy the professor in charge, by personal interview, of his ability to do the work.

Fee for the course, *ten dollars*.

COURSES IN MECHANICAL DRAWING

BLAIR N. REILEY in charge. H. J. BUR, FRANK T. WEILER, EDWARD C. MOORE, Instructors.

This class is intended to meet the needs of persons to whom a knowledge of Mechanical Drawing is necessary and whose daily employment makes it possible for them to attend only in the evening.

So far as possible, the instruction is the same as that given in the day course; the only difference being in the amount of time devoted to the work.

The full course of instruction is divided into three years, as follows:

FIRST YEAR.—Use of mathematical instruments, orthographic projections, intersections, development of surfaces. Fee, *five dollars*.

SECOND YEAR.—The application of the development of surfaces to machine construction; detailed working drawings of machinery. Fee, *six dollars*.

THIRD YEAR.—Practical working drawings in machine construction.

Monday and Wednesday, Tuesday and Thursday. Fee, *six dollars*.

CERTIFICATE.—The certificate of the Department of Evening Courses is granted to students who complete the three years' course and pass satisfactory examinations in the work prescribed.

COURSES IN SHOP-WORK.

I. WOODWORKING.—Exercises in joinery, turning, pattern-making. Tuesday and Thursday. R. WILLETTE CLINGER, Instructor. Fee, *five dollars*.

II. BENCH-WORK IN IRON.—Chipping and filing. Tuesday and Thursday. CLEMENT E. MOSSOP, Instructor. Fee, *five dollars*.

III. MACHINE CONSTRUCTION.—Use of machine tools and practical work in the building of machinery. Monday and Wednesday, and Tuesday and Thursday. CLEMENT E. MOSSOP, Instructor. Fee, *five dollars*.

IV. FORGING.—Exercises in forging and welding, forging and tempering of machine tools, ornamental work from designs. THOMAS MCCREIGHT, Instructor. Tuesday and Thursday. Fee, *five dollars*.

The shops are equipped with every appliance necessary for the instruction.

A deposit of *three dollars*, as security against breakage of tools, is required of students in the Machine Construction Class. This is returned at the close of the session, less the cost of the tools injured.

COMMERCIAL COURSES

PROFESSOR PARKE SCHOCH, A. M., Director. PROFESSORS CHARLES D. CLARKSON, JOHN T. HOLDSWORTH, CARL LEWIS ALTMAIER, JONATHAN J. SPARLING. CAROLYN H. LOCKE, Instructor.

The following courses are offered :

I. COURSE IN BOOKKEEPING, COMMERCIAL ARITHMETIC, AND PENMANSHIP

The work of this course is divided into three years, as follows :

First Year.—Bookkeeping. Elements of single and double entry, with incidental instruction in business forms and customs.

Commercial Arithmetic. Rapid drill ; fractions, weights and measures ; discount ; interest.

Penmanship.—A plain, rapid business hand.

Monday and Thursday. Fee, *five dollars*.

Second Year.—Bookkeeping. First year's work continued, introducing auxiliary books—cash-book, bill-book, sales and invoice register, etc.

Commercial Arithmetic. Rapid drill ; discount and interest, partial payments, equation of accounts.

Tuesday and Friday. Fee, *five dollars*.

Third Year.—Bookkeeping. Advanced work in shipments, consignments, jobbing, joint-stock companies, corporations.

Commercial Arithmetic. Financial problems involving exchanges, stocks, bonds, partnerships, joint-stock company accounts.

Monday and Thursday. Fee, *six dollars*.

II. OFFICE COURSE IN STENOGRAPHY AND TYPEWRITING

The work of this course covers three years, divided as follows :

First Year.—Stenography. Theory of Pitman system, accompanied by frequent drills in phonetics.

The student is prepared for slow dictation by the end of the first year.

Typewriting—Word exercises ; copying of letters and exercises to illustrate the use of different parts of the machine.

Monday and Thursday. Fee, *five dollars*.

Second Year.—Stenography. Half of the session is spent upon the dictation of carefully graded exercises, with correct shorthand keys constantly before the student, followed by the reading and transcribing of notes. A moderate rate of speed is acquired in this year.

Typewriting—Exercises in copying and spacing and in transcribing from rough draft.

Tuesday and Friday. Fee, *five dollars*.

Third Year.—Stenography. The entire session is devoted to varied dictation, accompanied by nightly transcript of notes upon the typewriter. By the end of this year, the student acquires a note-taking speed of from ninety to a hundred words per minute.

COMMERCIAL COURSES

PROFESSOR PARKE SCHOCH, A. M., Director. PROFESSORS CHARLES D. CLARKSON, JOHN T. HOLDSWORTH, CARL LEWIS ALTMAIER, JONATHAN J. SPARLING. CAROLYN H. LOCKE, Instructor.

The following courses are offered :

I. COURSE IN BOOKKEEPING, COMMERCIAL ARITHMETIC, AND PENMANSHIP

The work of this course is divided into three years, as follows :

First Year.—Bookkeeping. Elements of single and double entry, with incidental instruction in business forms and customs.

Commercial Arithmetic. Rapid drill ; fractions, weight and measures ; discount ; interest.

Penmanship.—A plain, rapid business hand.

Monday and Thursday. Fee, *five dollars*.

Second Year.—Bookkeeping. First year's work continued, introducing auxiliary books—cash-book, bill-book, sales and invoice register, etc.

Commercial Arithmetic. Rapid drill ; discount and interest, partial payments, equation of accounts.

Tuesday and Friday. Fee, *five dollars*.

Third Year.—Bookkeeping. Advanced work in shipments, consignments, jobbing, joint-stock companies, corporations.

Commercial Arithmetic. Financial problems involving exchange, stocks, bonds, partnerships, joint-stock companies.

Monday and Thursday. Fee, six dollars.

3. Special Course in Stenography and Typewriting.

Length of this course covers three years, divided as follows:

~~Handwriting~~ Handwriting. Theory of Pitman system, ~~Handwriting~~ drills in phonetics.

For slow dictation by the end of

...; copying of letters and
... of different parts of the

Shipping and handling: Free, first dollars

Half of the session is devoted to graded exercises, with the student, following the teacher, taking notes. A most

...and ...

The other section is devoted to the study of the effects of the different types of soil on the growth of the plants. It is one of the most important parts of the course.

Typewriting. Arrangement of papers—legal papers, specifications. Explanation of duplicating processes, press-copying apparatus, and leading makes of typewriters.

Tuesday and Friday. Fee, *six dollars*.

ADVANCED STANDING.—Applicants who wish to do advanced work in either bookkeeping or stenography are admitted to the second- or third-year class of either course, on evidence, by examination, of ability to pursue the work of the desired grade.

ENGLISH.—The class in English is provided primarily for the purpose of affording instruction to those students in either of the foregoing courses who fail to meet the requirements as set forth under "Certificate" below. No additional fee is charged.

SPECIAL STUDENTS, also, are admitted to this class. The instruction aims at thorough drill in punctuation, capitalization, sentence structure, paragraphing, ready writing—in short, a practical presentation of the subject, with a view to meeting the needs of the office clerk.

The class attends on Wednesday evening. Fee, for special students, *three dollars*.

TEXT-BOOKS.—Students are required to supply their own text-books.

CERTIFICATE

The Certificate of the Department of Evening Classes is granted to students who complete either one of the two courses announced, and who pass a satisfactory examination in English composition. Students who fail to pass the English examination must attend this class for one year.

COURSES IN DOMESTIC ARTS AND DOMESTIC SCIENCE

DRESSMAKING

CAROLINE A. M. HALL, Director. MARY L. SARGENT,
MARY E. EASTWOOD, JENNIE COLLINGWOOD, MARY H.
BROWN, MARY C. DAVIS, MARY L. COMAR, LAURA E. WAG-
NER, Instructors.

FIRST GRADE.—This grade is devoted to the fundamen-
tal principles of dressmaking. One plain dress is com-
pleted.

The work comprises :

Choice of materials ; textiles as to color and application
to dress.

Taking measurements ; drafting foundation skirt ; draft-
ing draperies ; finishing skirt for trimming or draping ;
making lined skirt.

Plans for completing skirts ; cutting waists from measure-
ments taken from different members of the class ; basting,
fitting ; planning trimming ; general finish.

Monday and Thursday, or Tuesday and Friday. Fee,
four dollars.

SECOND GRADE.—In this grade, attention is paid to
taking measurements of different figures and to drafting
patterns from the same.

Three dresses are made of different materials. The
course includes :

Color and textiles ; their various uses and relations to
personal adornment.

Typewriting. Arrangement of papers—legal papers, specifications. Explanation of duplicating processes, press-copying apparatus, and leading makes of typewriters.

Tuesday and Friday. Fee, *six dollars*.

ADVANCED STANDING.—Applicants who wish to do advanced work in either bookkeeping or stenography are admitted to the second- or third-year class of either course, on evidence, by examination, of ability to pursue the work of the desired grade.

ENGLISH.—The class in English is provided primarily for the purpose of affording instruction to those students in either of the foregoing courses who fail to meet the requirements as set forth under "Certificate" below. No additional fee is charged.

SPECIAL STUDENTS, also, are admitted to this class. The instruction aims at thorough drill in punctuation, capitalization, sentence structure, paragraphing, ready writing—in short, a practical presentation of the subject, with a view to meeting the needs of the office clerk.

The class attends on Wednesday evening. Fee, for special students, *three dollars*.

TEXT-BOOKS.—Students are required to supply their own text-books.

CERTIFICATE

The Certificate of the Department of Evening Classes is granted to students who complete either one of the two courses announced, and who pass a satisfactory examination in English composition. Students who fail to pass the English examination must attend this class for one year.

COURSES IN DOMESTIC ARTS AND DOMESTIC SCIENCE

DRESSMAKING

CAROLINE A. M. HALL, Director. MARY L. SARGENT, MARY E. EASTWOOD, JENNIE COLLINGWOOD, MARY H. BROWN, MARY C. DAVIS, MARY L. COMAR, LAURA E. WAGNER, Instructors.

FIRST GRADE.—This grade is devoted to the fundamental principles of dressmaking. One plain dress is completed.

The work comprises :

Choice of materials ; textiles as to color and application to dress.

Taking measurements ; drafting foundation skirt ; drafting draperies ; finishing skirt for trimming or draping ; making lined skirt.

Plans for completing skirts ; cutting waists from measurements taken from different members of the class ; basting, fitting ; planning trimming ; general finish.

Monday and Thursday, or Tuesday and Friday. Fee, *four dollars*.

SECOND GRADE.—In this grade, attention is paid to taking measurements of different figures and to drafting patterns from the same.

Three dresses are made of different materials. The course includes :

Color and textiles ; their various uses and relations to personal adornment.

Typewriting. Arrangement of papers — legal papers, specifications. Explanation of duplicating processes, press-copying apparatus, and leading makes of typewriters.

Tuesday and Friday. Fee, *six dollars*.

ADVANCED STANDING.—Applicants who wish to do advanced work in either bookkeeping or stenography are admitted to the second- or third-year class of either course, on evidence, by examination, of ability to pursue the work of the desired grade.

ENGLISH.—The class in English is provided primarily for the purpose of affording instruction to those students in either of the foregoing courses who fail to meet the requirements as set forth under "Certificate" below. No additional fee is charged.

SPECIAL STUDENTS, also, are admitted to this class. The instruction aims at thorough drill in punctuation, capitalization, sentence structure, paragraphing, ready writing—in short, a practical presentation of the subject, with a view to meeting the needs of the office clerk.

The class attends on Wednesday evening. Fee, for special students, *three dollars*.

TEXT-BOOKS.—Students are required to supply their own text-books.

CERTIFICATE

The Certificate of the Department of Evening Classes is granted to students who complete either one of the two courses announced, and who pass a satisfactory examination in English composition. Students who fail to pass the English examination must attend this class for one year.

COURSES IN DOMESTIC ARTS AND DOMESTIC SCIENCE

DRESSMAKING

CAROLINE A. M. HALL, Director. MARY L. SARGENT,
MARY E. EASTWOOD, JENNIE COLLINGWOOD, MARY H.
BROWN, MARY C. DAVIS, MARY L. COMAR, LAURA E. WAG-
NER, Instructors.

FIRST GRADE.—This grade is devoted to the fundamen-
tal principles of dressmaking. One plain dress is com-
pleted.

The work comprises :

Choice of materials ; textiles as to color and application
to dress.

Taking measurements ; drafting foundation skirt ; draft-
ing draperies ; finishing skirt for trimming or draping ;
making lined skirt.

Plans for completing skirts ; cutting waists from measure-
ments taken from different members of the class ; basting,
fitting ; planning trimming ; general finish.

Monday and Thursday, or Tuesday and Friday. Fee,
four dollars.

SECOND GRADE.—In this grade, attention is paid to
taking measurements of different figures and to drafting
patterns from the same.

Three dresses are made of different materials. The
course includes :

Color and textiles ; their various uses and relations to
personal adornment.

Typewriting. Arrangement of papers—legal papers, specifications. Explanation of duplicating processes, press-copying apparatus, and leading makes of typewriters.

Tuesday and Friday. Fee, *six dollars*.

ADVANCED STANDING.—Applicants who wish to do advanced work in either bookkeeping or stenography are admitted to the second- or third-year class of either course, on evidence, by examination, of ability to pursue the work of the desired grade.

ENGLISH.—The class in English is provided primarily for the purpose of affording instruction to those students in either of the foregoing courses who fail to meet the requirements as set forth under "Certificate" below. No additional fee is charged.

SPECIAL STUDENTS, also, are admitted to this class. The instruction aims at thorough drill in punctuation, capitalization, sentence structure, paragraphing, ready writing—in short, a practical presentation of the subject, with a view to meeting the needs of the office clerk.

The class attends on Wednesday evening. Fee, for special students, *three dollars*.

TEXT-BOOKS.—Students are required to supply their own text-books.

CERTIFICATE

The Certificate of the Department of Evening Classes is granted to students who complete either one of the two courses announced, and who pass a satisfactory examination in English composition. Students who fail to pass the English examination must attend this class for one year.

COURSES IN DOMESTIC ARTS AND DOMESTIC SCIENCE

DRESSMAKING

CAROLINE A. M. HALL, Director. MARY L. SARGENT,
MARY E. EASTWOOD, JENNIE COLLINGWOOD, MARY H.
BROWN, MARY C. DAVIS, MARY L. COMAR, LAURA E. WAG-
NER, Instructors.

FIRST GRADE.—This grade is devoted to the fundamen-
tal principles of dressmaking. One plain dress is com-
pleted.

The work comprises :

Choice of materials ; textiles as to color and application
to dress.

Taking measurements ; drafting foundation skirt ; draft-
ing draperies ; finishing skirt for trimming or draping ;
making lined skirt.

Plans for completing skirts ; cutting waists from measure-
ments taken from different members of the class ; basting,
fitting ; planning trimming ; general finish.

Monday and Thursday, or Tuesday and Friday. Fee,
four dollars.

SECOND GRADE.—In this grade, attention is paid to
taking measurements of different figures and to drafting
patterns from the same.

Three dresses are made of different materials. The
course includes :

Color and textiles ; their various uses and relations to
personal adornment.

Taking measurements ; drafting plain waist from different measurements ; drafting waist with extra seams for large figure ; cutting and matching striped, plaid, or figured material for waist—making and trimming the same ; drafting and making dresses on the gown-form, from the student's own design.

Monday and Thursday, or Tuesday and Friday. The fee, including the price of the drafting-chart which is supplied to each student by the Institute, is *eight dollars*.

THIRD GRADE.—The work of this grade is chiefly an extension of that of the two preceding grades, with the additional subjects of instruction named below. For further practice, students may receive and execute orders. The work comprises :

Advanced drafting. Choice of materials for gowns of special character.

Making dresses of different kinds.

Making models of inexpensive materials to test the design.

Child's dress—materials, drafting, cutting, and making the same.

Monday and Thursday, or Tuesday and Friday. Fee, *six dollars*.

Each grade occupies one session. In each grade, two lessons, of two hours each, are given weekly.

CERTIFICATE.—The certificate of the Department of Evening Courses is granted to students who complete the three years' course and pass satisfactory examinations in the work prescribed.

SEWING

COURSE IN HAND AND MACHINE SEWING.—The Course in Sewing includes the simple stitches used in hand and machine sewing and their application in the making of garments. Work cut and planned in the classroom must be completed at home. All materials are supplied by the students.

Students who have not had the necessary preliminary training or experience in hand and machine sewing are expected to take this course, in whole or in part, before beginning the dressmaking work.

The course consists of three grades, each grade occupying one term or session. Two lessons, of two hours each, are given weekly.

Students who can meet the requirements of the preceding grades will be admitted to advanced standing.

Monday and Thursday, or Tuesday and Friday. Fee, *three dollars* for each session.

MILLINERY

EMILY G. SWETT, Director. CORA FOX and NELLIE M. LOTZ, Instructors.

FIRST GRADE.—In this grade the work begins with the study of the hat in detail. It includes: General principles of harmony of color; wiring, folds, fitted facing, shirred facing, puffed edge; bows and rosettes; fitted hat made, lined, and trimmed.

All the work is executed in practice materials which are selected and furnished by the student.

The knowledge so gained is applied at the end of the term in making one hat of choice materials.

Monday and Thursday. Fee, *four dollars*.

SECOND GRADE.—In this grade the bonnet and toque are studied, using for practice materials which are appropriate for the same. The work includes : Color and materials as related to the head-dress ; bonnet, with plain crown and with puffing, made, lined, and trimmed ; bonnet of more complex design ; toque made, lined, and trimmed ; practical work leading to a knowledge of the designing of bonnets and hats.

Tuesday and Friday. Fee, *six dollars*.

CERTIFICATE.—The certificate of the Department of Evening Courses is granted to students who complete the two years' course and pass satisfactory examinations in the work prescribed.

COOKERY

HELEN M. SPRING, Director. KATHARINE MCCOLLIN, Instructor.

FIRST COURSE.—Instruction in the composition and dietetic value of food materials. The lessons are arranged in logical order, and each principle is illustrated by the preparation of simple dishes. The instruction is largely individual, each student preparing an entire dish. The object of the course is the preparation of food in the most digestible and appetizing forms.

Monday. Fee, *five dollars*.

SECOND COURSE.—Instruction and practice of an advanced character, in the preparation of more complicated dishes and menus than are included in the First Course.

Tuesday. Fee, *six dollars*.

COURSE FOR WAITRESSES.—A course of eight lessons, including the following subjects in which every practical housekeeper should be expert: Care of dining-room and pantry; care of silver and cutlery; serving of breakfast, luncheon, and dinner; washing dishes; washing and ironing table-linen; removal of stains.

Thursday. Fee, *three dollars*.

A class for men in the *Use of the Chafing-dish* will be formed, if a sufficient number of students apply.

All the materials used in the instruction are supplied by the Institute.

COURSES IN ENGLISH LANGUAGE AND LITERATURE

HARRIET L. MASON in charge. ALICE M. BRENNAN,
LILLIAN M. DALTON, RUTH COLLINS, Instructors.

FIRST COURSE

LANGUAGE.—Review of essentials of English Grammar. Analysis and synthesis of sentences. Common errors. Punctuation. Figures of speech. Social and business forms of letter-writing.

LITERATURE.—Selected readings in American classics: Bryant, Poe, Longfellow, Holmes, Lowell, Whittier.

Tuesday and Friday, at 7.30.

Fee for the session, *four dollars*.

SECOND COURSE

LANGUAGE.—Elements of rhetoric. Words: synonyms, barbarisms, improprieties, solecisms. Sentence-writing: unity, concord, emphasis, correlation; periodic, loose, balanced, long, short. Elements of style: force, rapidity, life, smoothness. Paragraph-writing: unity, coherence, development.

LITERATURE.—Historical sketch of American literature. Readings from Irving, Emerson, Cooper, Hawthorne, Thoreau.

Monday and Thursday, at 7.30.

Fee for the session, *four dollars*.

THIRD COURSE

LANGUAGE.—Rhetorical analysis: studies in style and invention, based on the critical study of selections from typical English and American writers. The studies also illustrate the processes of description, narration, exposition, argumentation, persuasion. Composition and criticism—special attention is given to both class and individual criticism of the student's original work.

LITERATURE.—Historical sketch of English literature. Critical reading of selected plays of Shakespeare.

Monday and Thursday, at 7.30.

Fee for the session, *five dollars*.

The work of the three courses is progressive, and pupils are advanced from the lower to the higher course *on examinations* at the close of each session, or during the session if their progress warrants it. Upon satisfactorily passing all the examinations prescribed for the Third Course, students receive the Certificate of the Institute.

PHYSICAL TRAINING

CLASS FOR YOUNG WOMEN.—Wednesday and Friday. MAUDE G. HOPKINS, Director. Fee, *five dollars*.

CLASS FOR YOUNG MEN.—Monday and Thursday. J. PETERSON RYDER, S. B., Director. Fee, *five dollars*.

FREE CLASSES IN CHORAL MUSIC

CHARLES M. SCHMITZ, Director. JAMES M. DICKINSON, Accompanist.

The instruction in choral music is organized as follows :
I. The Drexel Chorus ; II. The Choral Class.

I. THE DREXEL CHORUS.—The Drexel Chorus is composed of men and women desirous of devoting themselves to the study and rendition of choral works by the great masters. The Chorus meets in the Auditorium where the grand organ is available in connection with the training.

The meetings of the Chorus extend over a session of six months, beginning in October and closing the end of March. The Chorus meets weekly on Monday, at 8 p. m. The first meeting will be on Monday, October 5.

Two public concerts are given, one about Christmas and the other at the close of the session.

Former members of the Drexel Chorus and members of the previous year's Choral Class are entitled to admission without further examination, upon presentation of the former year's class-ticket to the Registrar of the Institute.

New members must be able to read music fairly.

II. THE CHORAL CLASS.—The Choral Class, which is formed yearly, is for young men and young women who are desirous of studying choral music under such conditions as will lead to their admission to the Drexel Chorus. An acquaintance with musical notation is desirable, but a willingness to devote the necessary time to vocal training in choral singing is the chief qualification for admission. A new class is formed each year.

The class meets weekly in the Auditorium, on Wednesday, at 8 p. m., from October to March, inclusive. The first meeting will be on Wednesday, October 7.

A public concert is given at the end of the session.

There is no charge for the instruction and training in the Drexel Chorus or the Choral Class, but there is a fee of *one dollar* for registration.

New candidates for admission to the Drexel Chorus or to the Choral Class, must apply in person to Mr. Schmitz, the Director, for classification, at the Institute, as follows :

Thursday, September 24—7.30 to 9 p. m.

Friday, September 25—7.30 to 9 p. m.

Saturday, September 26—7.30 to 9 p. m.

Thursday, October 1—7.30 to 9 p. m.

Friday, October 2—7.30 to 9 p. m.

Saturday, October 3—7.30 to 9 p. m.

Monday, October 5—First rehearsal of the Drexel Chorus at 8 p. m.

Tuesday, October 6—7.30 to 9 p. m.

Wednesday, October 7—First rehearsal of the Choral Class at 8 p. m.

Thursday, October 8—7.30 to 9 p. m.

Friday, October 9—7.30 to 9 p. m.

Saturday, October 10—7.30 to 9 p. m.

Tuesday, October 13—7.30 to 9 p. m.

DEPARTMENT OF FREE PUBLIC LECTURES AND CONCERTS

The work of the department includes the Free Courses of Public Lectures and Concerts which are given during the winter months, beginning in November and continuing until the end of March. During the greater part of the season, a concert is given every Thursday evening. An idea of the place these lectures and concerts hold in the work of the Institute may be formed from the fact that the attendance during the season of 1902-03 was about thirty-eight thousand.

The following are the programs of the Lectures and Concerts for the past season :

LECTURES

Lecture on "Venice, the Beautiful," by Mr. F. Hopkinson Smith, New York.

A course of six lectures on "Italian Painting," by Fräulein Antonie Stolle, Boston.

Lecture on "Mexico: the Country and Its People," by Mr. Charles F. Warren, of the United States Department of Labor, Washington, D. C.

Lecture on "Mont Pelée and the Tragedy of Martinique," by Professor Angelo Heilprin.

Two lectures—"How Pompeii Was Destroyed," and "Venice of To-Day," by Mr. Henry G. Spaulding, Boston.

Musical Lecture, "Folk-Song in America," by Mr. H. E. Krehbiel, New York. Assisted by Mrs. H. E. Krehbiel, Soprano, and Miss Eleanor Foster, Pianist.

A course of six lectures on "The Structure and Functions of the Human Body," by Professor Albert P. Brubaker, M. D., Drexel Institute, Philadelphia.

Two lectures on "Japan and Japanese Art," by Professor Ernest F. Fenollosa.

Two lectures on "Hans Christian Andersen," by Miss Marie L. Shedlock.

Two lectures on "Camping Expeditions Among the Rockies of British Columbia," by Mr. Howard W. Du Bois, Philadelphia.

Lecture on "Explorations in Eastern Palestine and Petra," by Professor William Libbey, D.Sc., Princeton University.

Lecture on "Shakespeare's Philosophy," by Sidney Lee, Litt.D., London, England.

Two lectures on "The Land and the People of New Zealand," by Mr. David Orren Hales of New Zealand.

CONCERTS

1. Mr. Frederick Maxson, Organ. Edith May DuMond, Soprano.
2. Mr. William Silvano Thunder, Organ. Mr. George Dundas, Tenor.
3. Mr. Minton Pyne, Organ. Mr. Martinus Van Gelder, Violin. Mr. Thomas a' Becket, at the Piano.
4. Mr. Ellis Clark Hammann, Organ. Mr. G. Russell Strauss, Baritone.
5. Mr. James M. Dickinson, Organ. Miss Lotta K. Garrison, Soprano. Miss Anna Elizabeth Kelley, Contralto. Mr. Owen S. Fitzgerald, Tenor.
6. Mr. George Alexander A. West, Organ. Mr. Frederick E. Hahn, Violin.
7. Mr. Henry Gordon Thunder, Organ. Miss May Walters, Contralto.
8. HARP RECITAL. Mr. John Cheshire, London, England. Assisted by Mrs. John Cheshire, Pianist, and Miss Nina Picton, Soprano.
9. Mr. Ralph Kinder, Organ. Agnes Thomson, Soprano.
10. KALTENBORN STRING QUARTET. Mr. Franz Kaltenborn, First Violin; Mr. William Rowell, Second Violin; Mr. Gustave Bach, Viola; Mr. Louis Heine, Cello.
11. Mr. David D. Wood, Organ. Mrs. David D. Wood, Soprano.
12. Mr. S. Tudor Strang, Organ. Mr. Henri G. Scott, Bass.
13. Mr. James M. Dickinson, Organ. Instrumental Septet, under the direction of Mr. Charles M. Schmitz.

The following Concerts were given by the Drexel Chorus:

14. CHRISTMAS CONCERT. Oratorio of Stabat Mater, by Rossini, under the direction of Mr. Charles M. Schmitz. Soloists: Madame Emma Suelke, Soprano; Miss Kathryn McGuckin, Contralto; Mr. Harry B. Gurney, Tenor; Mr. Henri G. Scott, Bass. Mr. James M. Dickinson, Organist; Mr. Louis Volmer, Pianist.

15. EASTER CONCERT. Cantata, "The Rose Maiden." Music by Frederic H. Cowan. Under the direction of Mr. Charles M. Schmitz. Soloists: Agnes Thomson, Soprano; Miss Anna Elizabeth Kelley, Contralto. Mr. Harry B. Gurney, Tenor; Mr. G. Russell Strauss, Baritone. Mr. James M. Dickinson, Organist; Mr. Louis Volmer, Pianist.

16. CONCERT BY THE CHORAL CLASS, under the direction of Mr. Charles M. Schmitz. Miss Lotta K. Garrison, Soprano. Mr. James M. Dickinson, Organist.

The last concert makes the one hundred and eighty-second in number since the Free Public Concerts were begun.

LIBRARY AND READING-ROOM

STAFF

- ALICE B. KROEGER,**
Librarian, and Director of the Library School.
- SARAH WARE CATTELL,**
Assistant Librarian, and Instructor in the Library School.
- FANNY S. MATHER,**
Assistant Librarian, and Instructor in the Library School.
- CHARLOTTE KENNEDY HANNUM,**
Assistant in charge of the Circulating Department.
- MARY LOUISE ERSKINE,**
Library Attendant.
- EMMA L. HELLINGS,**
Evening Assistant.
-

The chief purpose of the Library is to supplement the work of the several departments of the Institute. Science, the useful arts, and the fine arts are most largely represented. There is, however, a good collection in general literature. In addition to its use by students and instructors, the Library is free to all residents of Philadelphia for reference and for the home use of books.

The Library has now thirty thousand volumes and four thousand pamphlets. The Reading-room is supplied with one hundred and eighty periodicals. The books are classified by the decimal classification and are arranged in the alcoves, to which the readers have free access. The dictionary card catalogue, for public use, is

made as complete as possible by means of references and analyticals. The shelf-list is on cards, forming a classed catalogue for official use.

The Library and the Reading-room are open every day, except Sundays and legal holidays, from 9 a. m. to 6 p. m., and during the sessions of the Evening Classes, from 9 a. m. to 10 p. m.

RELATION OF THE LIBRARY TO THE DEPARTMENTS

All books and periodicals are under the management of the Library Department, but every privilege is granted to professors and students in their use of the books. The departments of the Institute have no special libraries. Each instructor can draw from the Library an unlimited number of books which are used in the departments as daily tools. In addition to these books, the professors are given space and tables in the alcoves for "reserved" books, which include such books as the students are required to use constantly. These cannot be circulated outside the Library except over night. In such courses as decoration and architecture, a large number of the fine art books are taken to those department rooms by the directors, and kept during a term. Constant use is made of these privileges, and the Library is thus brought into close relation with the several departments.

REFERENCE DEPARTMENT AND READING-ROOM

The Reference Department, containing the books which are strictly reference in character, such as encyclopedias, dictionaries, etc., includes one thousand volumes, and is placed in the most accessible part of the Library, where the books may be freely used.

The Reading-room has on file one hundred and eighty periodicals, and a few daily newspapers. The bound volumes of general periodicals, and indexes thereto, are kept in a special alcove at the rear of the Library.

ART ROOM

A portion of the Library has been set apart for books on the fine arts, forming a special alcove containing two thousand volumes. The collection embraces many handsomely illustrated volumes. It is especially strong in the decorative arts.

COLLECTION OF PHOTOGRAPHS AND PRINTS.—The Library has a collection of about two thousand mounted photographs, largely of architectural and decorative subjects. These are classified and catalogued. In addition to this collection of photographs, the Library has received, as a gift from Mr. George C. Thomas, a series of valuable etchings of Ancient Paris and a series of photographs of Old London. One of the most interesting and artistic possessions of the Library is a collection of Japanese prints, in color, by famous Japanese artists. This is a gift of Mr. James W. Paul, Jr., President of the Board of Trustees. Additions are constantly being made to the collection.

COLLECTION OF LANTERN SLIDES.—This collection is for the use of the instructors, and numbers sixteen hundred slides. The subjects are chiefly architecture, painting, commerce, and history of printing. The slides are classified and catalogued.

SPECIAL COLLECTIONS

1. **THE ANTHONY J. DREXEL BEQUEST** consists of the private library of the founder of the Institute, bequeathed by him to the Library (1893). It comprises editions of the standard English and American authors.

2. **THE GEORGE W. CHILDS COLLECTION OF MANUSCRIPTS AND AUTOGRAPHS**, collected by the late Mr. George W. Childs during his lifetime, and presented by him to the Library in December, 1891, consists of valuable original manuscripts of modern authors and autograph letters of noted persons. Among the treasures of the collection are : The original manuscript of Dickens's "Our Mutual Friend," bound in two volumes, closely written, as it was sent to the printer, with innumerable erasures and insertions ; an autograph manuscript of Thackeray's "Lecture on George III," handsomely bound and extra-illustrated with portraits and original drawings and water-colors by Thackeray (this is the copy from which he read when he lectured in America); the original manuscript of Poe's "The Murders in the Rue Morgue"; of Lamb's Essay on Witches and other Night Fears," signed Elia ; of Bremer's " Hertha "; of Godwin's "Cloudesley, a Novel "; of André's "The Cow Chace," and of many other important works. The autograph letters comprise, among others, a set of letters from the Presidents of the United States; the Pinkerton correspondence (in four volumes), including letters from many noted Englishmen, of the latter part of the eighteenth century, to John Pinkerton ; and collections of miscellaneous letters, written by English and American authors and statesmen.

3. **THE CHARLES H. JARVIS MEMORIAL LIBRARY OF MUSIC**, presented in 1896 by the daughters of the late Mr. Jarvis, an eminent Philadelphia musician. It comprises a collection of twelve hundred and thirty-six bound volumes of music, including the piano and orchestral works of many of the classical composers. This Musical Library is handsomely housed in a room at the rear of the Library, with a special author and classed card catalogue, bringing out, so far as

possible, the contents of each volume under authors and subjects. The musical collection of the sister of Mr. Jarvis, the late Mrs. Helen Jarvis Davis, is also contained in the Musical Library. It was presented by her son, Mr. Charles H. Davis. The Musical Library is for reference only.

4. THE GEORGE M. STANDISH COLLECTION was presented to the Library in 1898, by an American gentleman, for many years a resident of Italy. The collection comprises his personal library gathered during this time, and is made up of examples of early printed books, rare works on art, architecture, and antiquities, fine editions of the Italian classics, a large number of English books on art, literature, and history, dictionaries, prints, photographs and drawings. A special alcove, suitably inscribed, is set apart for the collection, to which access is given on application to the Librarian.

EXHIBIT ALCOVE

Frequent exhibits of photographs, prints, and plates from illustrated books are held in the Exhibit Alcove.

PUBLICATIONS

A series of Reference Lists is issued occasionally; three numbers have appeared: No. 1, Costume; No. 2, Music; No. 3, Decoration and Design. These are sold at a nominal price.

DONORS

Among those who have given largely to the Library, besides the founder, are: Mr. James W. Paul, Jr., Mr. George W. Childs Drexel, Mr. John R. Drexel, Mrs. George W. Childs, Mr. George C. Thomas, Mr. Joseph G. Rosengarten, Mr. Clarence S. Bement, Mr. George M. Standish, Mrs. Edwin W. Lehman, the late Mr. George W. Childs, and the late Mrs. J. Dundas Lippincott.

MUSEUM

MARY T. MAC ALISTER, Curator.

The formation of a museum of fine and industrial art was part of the original scheme for the Institute, as approved by its founder. The object was to place within the walls of the Institute such art collections as would be of value in connection with the various lines of instruction, and would also serve as a museum for the general public. The founder's deep interest in this project was shown by the gifts he made to the Museum during his lifetime, and by the bequest of his pictures and other art objects belonging to him at the time of his death. The intentions of the founder have been generously seconded by members of his family and others. With the exception of a few purchases made at the close of the Columbian Exposition at Chicago, in 1893, the Museum, as it now stands, has been built up almost wholly by gift. The beginning of the collections was made by President Mac Alister in London, in 1891, with the kind coöperation of the late Sir Philip Cunliffe Owen, Director of the South Kensington Museums, and Mr. Purdon Clarke, at that time Keeper of the India Museum. These original purchases, consisting of textiles, furniture, ceramics (chiefly oriental), wood-carvings, metal-work, and oriental embroideries, are of great interest and permanent value.

The installation of the Museum is unsurpassed by that of any museum in the United States. The cases have been made from designs furnished by the late Sir Philip Cunliffe

Owen, and are of the finest quality and well adapted to the display of the collections which they contain.

The growth of the Museum has been so rapid that it has not been deemed advisable thus far to print a general catalogue of the collections; but the labels briefly describing all important objects are a useful aid to visitors.

The accommodations of the large room originally appropriated to the Museum were found to be insufficient seven years ago, necessitating the distribution of many of the finest collections throughout the court, corridors, and rooms of the Institute building. Some of these will be assembled in the extension of the Museum to be opened this year.

The chief collections in the Museum are as follows:

1. The collection of European Textiles, dating from the fourteenth to the eighteenth century inclusive, presented by the founder of the Institute.
2. The collection of India Printed Fabrics, presented by the founder of the Institute.
3. Collections of European Bronzes, Ceramics, etc., presented or bequeathed by the founder of the Institute.
4. The Memorial Collection to Mrs. Anthony J. Drexel, made by her daughter, the late Mrs. James W. Paul, Jr., consisting of ceramics, metal-work, wood-carvings, and Italian ecclesiastical embroideries of the sixteenth and seventeenth centuries.
5. The Memorial Collection to Mrs. James W. Paul, Jr., presented by her husband, consisting of laces, a magnificent pair of Meissen candelabra (formerly belonging to the late King Ludwig II of Bavaria), a fine seventeenth century

Flemish tapestry, the Doulton Mermaid Vase, a collection of Phoenician glassware, etc.

6. A collection of Royal and Imperial Sèvres Ware, presented by Mr. John H. Harjes, of Paris.

7. A collection of Egyptian Antiquities, presented by Colonel Anthony J. Drexel, representative of the arts and life of the ancient Egyptians. This collection was made for the Institute by Emil Brugsch Bey, Keeper of the Egyptian Museums at Boolak.

8. A collection of Ivories (European and Oriental) presented by the late Mr. George W. Childs.

9. A collection of Engravings and Etchings, embracing examples of work chiefly by the French, English, and German masters, presented by the late Mr. George W. Childs.

10. A collection of Japanese Ceramics, presented by Dr. Edward H. Williams.

11. A collection of Laces, Oriental Embroideries, Artistic Jewelry, Ceramics, and other articles of artistic or historic interest, presented by Mrs. George W. Childs.

12. A small collection of Tanagra Figurines, presented by Colonel Anthony J. Drexel.

13. A Memorial Collection of Ceramics, Metal-work, and Embroideries to the late Lieutenant Allan G. Paul, U. S. N., presented by his family.

14. A collection of Ivories and Ceramics, presented by Mrs. Joseph W. Drexel.

15. A collection of Persian, Moorish, and Arab Arms, presented by Colonel Anthony J. Drexel.

16. A collection embracing some fine examples of Japa-

nese Lacquer and Bronze Work, a bronze statuette of Jizo, an ancient German Clock, small jeweled and enameled French clocks, etc., presented by Mrs. Alexander Van Rensselaer.

17. A collection of colored plaster reproductions of the interior of the Alhambra, a piece of early French Gothic sculpture, and two paintings, presented by the late Mr. John A. Johann.

18. A collection of arms, ancient furniture, textiles, wood-carvings, and ceramics, presented by Mr. George M. Standish.

19. A collection of Egyptian Prehistoric Flint Implements, from the "Finds" of H. W. Seton-Karr, presented by him through Mr. H. L. Clapp.

20. There is a good collection of plaster casts, representative of the sculpture of the Classic and Renaissance periods, which is placed in the art studios.

There are other art collections, such as the Collection of Japanese Prints, which are kept in the Library of the Institute.

21. Gifts to the Museum have been made also by Mr. John R. Drexel, Mr. George W. C. Drexel, the late Mr. George F. Tyler, Mr. Joseph G. Rosengarten, the late Mrs. Sarah Howard Peterson, the Estate of William H. Rawle, Messrs. Bailey, Banks & Biddle, the late Mr. Howard Potter of New York, Mrs. Thomas K. Conrad, Mrs. Catherine A. Howell Flourney, Mr. William Struthers, Mrs. C. P. Sinnickson, and Mrs. W. W. Hale.

THE BASILICA OF ST. MARK.—One of the most striking objects in the Museum is the View of the Façade of the Church of St. Mark, Venice, published by Ongania, which has been mounted and framed and set up for permanent

exhibition. The picture is eight feet wide and six feet high (without the frame), and is placed in the Lobby opening from the Great Court. It is in the finest quality of chromolithography, after the marbles, mosaics, and bronzes which make up the architecture, sculpture, and decoration of the façade, and gives a vivid impression of the splendid mass of design and color which has been so eloquently described by Ruskin in his "Stones of Venice." The details are large enough to admit of exact study.

The magnificent work, of which this picture forms a part, with plates of the innumerable details of the exterior and interior of the Church, in photogravure and chromolithography, is in the Library of the Institute, and may be consulted on application to the Librarian.

The entire work, comprising sixteen large folios and five volumes of text, and which required ten years for its publication, was presented to the Institute by Mr. James W. Paul, Jr.

The Museum is open free to the public, daily (except on Sundays and legal holidays), from 9 a. m. to 6 p. m., and during six months of the year (from October to March, inclusive) until 10 p. m.

PICTURE GALLERY

By the death, in 1901, of Mr. John D. Lankenau, the Institute came into possession, by bequest, of his important and valuable collection of paintings, which is to be known as THE JOHN D. LANKENAU COLLECTION. A fine gallery for these paintings has been provided in East Hall, and will be opened to the public in the fall of 1903. The collection is especially notable because of the large number of examples of the work of modern German artists, among which are paintings by Andreas Achenbach, Oswald Achenbach, Brandt, Dücker, Gebler, Grützner, Heilbuth, Knaus, Koekkoek, Lauenstein, Lessing, Preyer, Salentin, and Schreyer. It contains also fine works by Corot, Daubigny, Diaz, Dupré, Jimenez, and Ziem. There are also interesting copies of paintings by Raphael, Carlo Dolci, and Andrea del Sarto.

The paintings bequeathed by the founder will also be exhibited in the Gallery. Among these are examples of the works of Meissonier, Bouguereau, Jules Stewart, Coignard, Dupray, Cesar de Cock, Boldini, Rico, Michetti, Madrazo, Jimenez, Ecüsquisa, Van Marcke, Gierynski, Ridgway Knight, Richards, Hamilton, and others.

The Picture Gallery will be open to the public daily, except on Sundays and legal holidays, from 9 a. m. until 4 p. m., and on stated evenings during the winter months.

INDEX

Admission to Departments and Courses.	PAGE
Architecture	51
Chemistry	118
Commerce and Finance	137
Commercial Course for Teachers	128
Cookery	143
Design and Decoration	43
Domestic Arts, Normal Course in	169
Domestic Science, Normal Course in	151
Domestic Science and Arts, Junior and Advanced Elective Courses	181
Drawing, Painting, and Modeling	32, 38
Dressmaking	157, 158
Engineering, Electrical and Mechanical	60
English Language and Literature	192
Evening Courses	199-239
Illustration	29, 38
Library School	187
Machine Construction	99
Mathematics	104
Mechanic Arts	88
Mechanical Drawing	93
Millinery	163
Physical Training	196
Physics	107, 108, 109, 110
Wood-Carving	33
Advisory Board of Women	14
Architecture, School of	45
Course of Instruction	46
Faculty and Instructors	45
Graduate Course	49
Art, Fine and Applied, Department of	27
Faculty and Instructors	27
Prizes	35
Scholarships	29, 35
Board of Trustees	13
Calendar	vi

	PAGE
Chemistry, Courses in	112
Courses of Instruction	112
Instructors	112
Choral Music, Free Classes in	238
Clay Modeling, Course in	32
Commerce and Finance, Department of	120
Commercial Course for Teachers	128
Commercial Museum	136
Courses of Instruction	122
Distribution of Time	127, 130, 132, 134, 135
Faculty and Instructors	120
Office Courses	131
School of Commerce and Accounts	122
Departmental Statements. <i>See</i> Departments of Instruction.	
Departments and Courses of Instruction	10, 21
Design and Decoration, Courses in	39
Course of Instruction	40
Graduate Courses	41
Instructors	39
Diplomas and Certificates. <i>See</i> Departments of Instruction.	
Domestic Arts, Department of	153
Dressmaking, Courses in	153
Instructors	153
Millinery, Courses in	160
Sewing, Course in	158
Domestic Science, Department of	139
Courses in Cookery and Household Economics	140
Instructors	139
Normal Course in Domestic Science	144
Domestic Science and Arts, Department of Junior	173
Courses of Instruction	174
Faculty and Instructors	173
Subjects of Instruction	178
Drawing, Painting, and Modeling, School of	30
Classes in	30
Dressmaking, Courses in	153
Courses of Instruction	153
Instructors	153
Drexel Institute	1
Annex	6
Auditorium	7

INDEX

257


Drexel Institute—Continued.	PAGE
Buildings, Description of	3
Court, The	6
Dedication	1
Departments, List of	10
East Hall	5
Endowment	2
Founder	1
Gymnasium	9
Heating, Lighting, and Ventilation	10
Laboratories, Studios, and Classrooms	5, 6
Lecture-Room	7
Lectures and Concerts, Free Public	3
Library and Reading-Room	8
Lobby, The	8
Main Building	3
Museum	9
Picture Gallery	8
Students Restaurant	6
Elective Courses. See Departments of Instruction.	
Engineering, School of Electrical and Mechanical	53
Classrooms and Laboratories	61
Courses of Instruction	57
Distribution of Time	57
Faculty and Instructors	55
Subjects of Instruction	68
Electrical Engineering	70
Mechanical Engineering	72
English Language and Literature, Courses in	190
Instructors	190
Equipment. See Departments of Instruction.	
Evening Courses, Department of	199
Fees and Terms.	
Architecture	51
Chemistry	119
Clay Modeling	37
Commerce and Finance	137
Commercial Course for Teachers	137
Cookery	143
Design and Decoration	44
Domestic Arts, Normal Course in	170

Fees and Terms—Continued.	PAGE
Domestic Science, Normal Course in	151
Domestic Science and Arts, Junior and Advanced Elective Courses in	182
Drawing, Painting, and Modeling	37
Dressmaking	159
Engineering, Electrical and Mechanical	61
English Language and Literature	192
Evening Courses	202-239
Illustration	36
Library School	188
Machine Construction	100
Mathematics	105
Mechanic Arts	89
Mechanical Drawing	93
Millinery	164
Physical Training	195, 196
Physics	110
Wood-Carving	37
Illustration, School of	28
Classes in	28
Scholarships, Free	29
Introduction	I
Laboratories and Workshops. <i>See</i> Departments of Instruction.	
Laboratory Work. <i>See</i> Departments of Instruction.	
Lectures and Concerts, Department of Free Public	240
Library and Reading-Room	243
Art Room	245
Collections, Special	245
Staff	243
Library School	183
Course of Instruction	184
Faculty and Instructors	183
Machine Construction, Course in	95
Course of Instruction	96
Faculty and Instructors	95
Mathematics, Courses in	101
Courses of Instruction	101
Instructors	101
Mechanic Arts, School of	80
Course of Instruction	82
Distribution of Time	85

INDEX

259

Mechanic Arts, School of—Continued.	PAGE
Faculty and Instructors	80
Mechanical Drawing, Course in	90
Course of Instruction	91
Faculty and Instructors	90
Millinery, Courses in	160
Courses of Instruction	160
Instructors	160
Museum Department	248
Normal Courses for the Training of Special Teachers.	
Commercial Course for Teachers	128
Domestic Arts	165
Domestic Science	144
Officers of Instruction and Administration	15
Offices	20
Physical Training, Department of	194
Directors	194
Lectures on Anatomy and Physiology	196
Physics, Courses in	106
Courses of Instruction	106
Instructors	106
Picture Gallery	253
Special Courses. See Departments of Instruction.	
Subjects of Instruction. See Departments of Instruction.	
Wood-Carving, Course in	33

 Drexel Institute
— OF —
Art, Science, and Industry
PHILADELPHIA

YEAR-BOOK
— OF THE —
Departments and Courses of Instruction



1904-1905

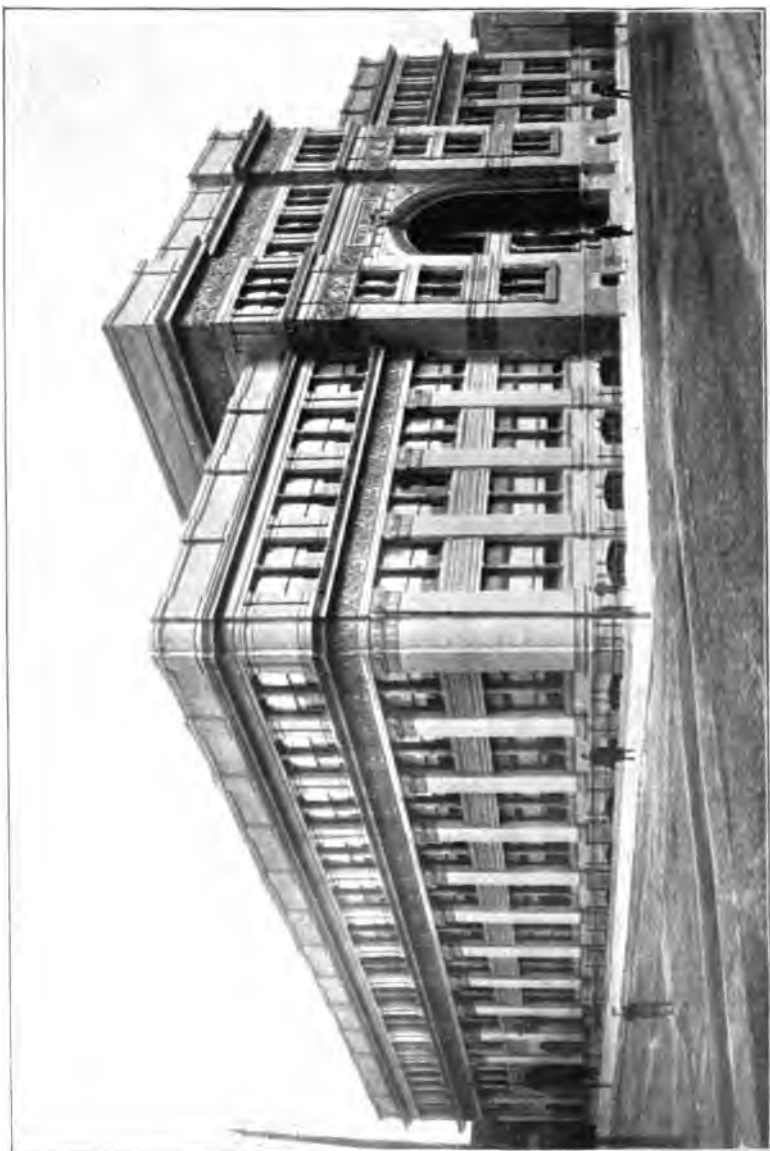
•

•

•

|

1000



MAIN BUILDING.

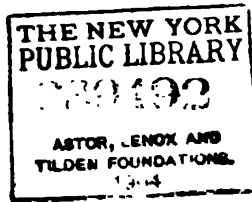
Drexel Institute
OF
Art, Science, and Industry
PHILADELPHIA

YEAR-BOOK
OF THE
Departments and Courses of Instruction



1904-1905

e. w. H.



.....Press of.....
THE JOHN C. WINSTON COMPANY
1006-1016 Arch Street
Philadelphia

A block of text at the bottom right of the page. It starts with ".....Press of.....", followed by "THE JOHN C. WINSTON COMPANY", then "1006-1016 Arch Street", and finally "Philadelphia".

CONTENTS

	PAGE
CALENDAR	vi
INTRODUCTION	i
BOARD OF TRUSTEES	13
ADVISORY BOARD OF WOMEN	14
OFFICERS OF INSTRUCTION AND ADMINISTRATION ..	15
DEPARTMENTS AND COURSES OF INSTRUCTION	23
DEPARTMENT OF FINE AND APPLIED ART	29
School of Illustration	30
School of Drawing, Painting, and Modeling	32
Clay Modeling	35
Wood-Carving	35
School of Design and Decoration	42
School of Architecture	48
DEPARTMENT OF SCIENCE AND TECHNOLOGY	56
School of Electrical Engineering	56
School of Mechanic Arts	89
Course in Mechanical Drawing	99
Course in Machine Construction	104
Special Courses in Science	110
Mathematics	110
Physics	115
Chemistry	123
DEPARTMENT OF COMMERCE AND FINANCE	132
School of Commerce and Accounts	134
Commercial Course for Teachers	140
Office Courses: Secretary—Bookkeeping—Stenography ..	144
DEPARTMENT OF DOMESTIC SCIENCE	152
Courses in Household Economics	153
Normal Course in Domestic Science	156

	PAGE
PREPARATORY COURSE FOR NURSES TRAINING SCHOOLS.....	169
DEPARTMENT OF DOMESTIC ARTS	177
Courses in Dressmaking	177
Courses in Millinery	185
Normal Course in Domestic Arts	190
JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS.....	199
Advanced Elective Courses.....	203
LIBRARY SCHOOL	209
COURSES IN ENGLISH LANGUAGE AND LITERATURE	216
DEPARTMENT OF PHYSICAL TRAINING	220
DEPARTMENT OF EVENING COURSES	225
ART COURSES	228
Free-hand Drawing	228
Drawing from the Antique	228
Wood-Carving	228
Clay Modeling	228
Composition and Picture Construction	228
Life Class	228
ARCHITECTURAL COURSES	229
Preparatory Class	229
Architectural Drawing.....	229
Architectural Design	230
House Construction Drawing	231
Building Construction	231
Pen and Ink Rendering	233
Water-Color Rendering	234
SCIENCE COURSES	236
Mathematics	236
Physics	237
Chemistry	238
Electrical and Mechanical Engineering Subjects.....	240
Mechanical Drawing	253
Shopwork.....	254

CONTENTS

v

	PAGE
COMMERCIAL COURSES	255
Bookkeeping—Commercial Arithmetic—Penmanship	255
Advanced Accounting	256
Stenography and Typewriting	257
DOMESTIC ARTS AND DOMESTIC SCIENCE	259
Dressmaking	259
Sewing	261
Millinery	262
Cookery	263
ENGLISH LANGUAGE AND LITERATURE	265
PHYSICAL TRAINING	266
CHORAL MUSIC	267
DEPARTMENT OF FREE PUBLIC LECTURES AND CONCERTS	269
LIBRARY DEPARTMENT	272
MUSEUM	278
PICTURE GALLERY	284
INDEX	285

CALENDAR

1904-05

FIRST TERM begins Monday, September 19th.

SECOND TERM begins Wednesday, February 1st.

EVENING COURSES begin Monday, October 3rd. Session closes Friday, March 31st.

COMMENCEMENT, Thursday, June 8th.

EXAMINATIONS FOR ADMISSION Monday and Tuesday, September 19th and 20th, 1904, and Tuesday and Wednesday, June 6th and 7th, 1905.

EXHIBITION OF WORK of the various Departments. Wednesday and Thursday, June 7th and 8th.

CLOSING EXERCISES AND EXHIBITION OF WORK of the Department of Evening Courses, Friday Evening, March 31st.

HOLIDAYS

THANKSGIVING DAY until the following Monday.

CHRISTMAS HOLIDAYS, Saturday, December 24th, to Tuesday, January 3rd, inclusive.

WASHINGTON'S BIRTHDAY, Wednesday, February 22nd.

EASTER HOLIDAYS, Thursday, April 20th, to Monday, April 24th, inclusive.

MEMORIAL DAY, Tuesday, May 30th.

DREXEL INSTITUTE

OF

ART, SCIENCE, AND INDUSTRY

INTRODUCTION

The Drexel Institute was founded in 1891, by Anthony J. Drexel, for the promotion of education in art, science, and industry. The chief object of the Institute is the extension and improvement of industrial education as a means of opening better and wider avenues of employment to young men and young women. At the same time, the academic departments provide for the general development and liberal training of the mind and character of the students, and in the more special and technical courses the same end is kept in view, so far as the necessary limitations of the instruction permit. In accordance with the founder's intention, the plan of organization has been made so comprehensive as to provide liberal means of culture for the masses, by means of evening classes in all the departments of the Institute; by free public lectures and concerts during the winter months; and through the Library, Museum, and Picture Gallery, which are open free to the public throughout the year.

The Main Building was dedicated with appropriate ceremonies on December 17th, 1891. A beginning was made in some of the departments in February, 1892, and in September of the same year instruction was

regularly begun in most of the departments included in the general scheme of organization.

The Institute is situated on Chestnut street, at the corner of Thirty-second street. This location was chosen as being the most central and the most convenient of access from all parts of the city. It is at a point near where a number of the principal highways converge, within easy reach of three or four main lines of street railways, but one block from the Pennsylvania station at Thirty-second street, and but three blocks from the Baltimore and Ohio station.

The founder's gifts to the institution, as a whole, amount to three million dollars. Of this sum, one million was expended upon the original building with its equipments and appliances, and two millions were set apart for the permanent endowment. To these should be added the cost of the new building, East Hall, and the investments in the Library, Museum, and Picture Gallery, which amount to over one million dollars—making the total amount of the endowment and the value of the property belonging to the Institute, four million dollars. The endowment fund of two million dollars is applied in maintaining the instruction. This enables the Institute to offer the instruction at extremely moderate and, in some of the evening classes, at almost nominal rates. A limited number of free scholarships are granted to deserving students.

The Institute is open to both sexes on equal terms. Students are recommended to enter regularly one of the departments or courses, but the same liberal opportunities are provided for those taking special or elective courses as in the regular courses.

The Evening Courses, which extend through six months of the year, from October to March, inclusive, offer instruction and training of the same kind and character, and with all the advantages of the extensive appliances and apparatus, as the instruction and training given in the day classes, and at much lower rates. Systematic courses in all the departments of the Institute are organized for the benefit of the evening students, and certificates are granted to those who finish these courses and pass the required examinations.

Besides the instruction provided in the several departments, the Institute carries on a large and important educational work through the means of the Free Public Lectures and Concerts which are given during the winter months. These lectures aim to furnish opportunities for general culture to the public at large, a work in which the Library, Museum, and Picture Gallery are made to cooperate. During the past few years, the attendance at the lectures and concerts has averaged thirty thousand.

In the administration of the Institute, every effort is made to bring the opportunities for improvement, which are so liberally provided, within the reach of the largest possible number.

BUILDINGS

The Institute buildings comprise the Main Building, the first erected, in 1891; East Hall, which was completed in 1902; and the Annex, a block of houses which have been gradually adapted to the uses of the Institute since 1893.

MAIN BUILDING

The Main Building is a large and imposing structure in the style of the classic Renaissance, or what would be better described as a modern interpretation of Greek forms. This gives assurance of its purity of spirit and explains the impression it makes as an harmonious whole. Even the colors of the marble used are in harmony with the scheme of decoration, which consists chiefly of buffs and reds. The Greek motives are met with in almost everything about the building, even to the bronze electric-light fixtures which were specially designed for the Institute. Additional beauty is lent to the exterior by the ornamental terra-cotta work. The façade on Chestnut street is broken in the middle by an attic story which projects above the roof of the structure proper. This is the centre of the ornamentation, for here the wide frieze which extends around the building, between the second and third stories, meets above the lofty archway. The portal, which is the main entrance, is twenty-six feet wide at the base and rises to a height of thirty-five feet. The decoration of the arch is elaborate and is made doubly interesting by the addition of a series of finely executed high-relief medallion portraits: Bach, representing music; Raphael, painting; Goethe, poetry; Columbus, navigation; Newton, mathematics; Faraday, physics; Humboldt, natural history; Jefferson, government; Galileo, astronomy; Shakespeare, drama; Michael Angelo, sculpture; William of Sens, architecture. In the spandrels of the arch are medallions of Apollo and Moses.

The central object of the arch is a figure representing the Genius of Knowledge. Above her, in the frieze, is a tablet bearing the words, "Drexel Institute." Another finely designed frieze extends across the attic.

The Main Building contains, with the exception of the Lecture-room and the Picture Gallery, all the large and important features of the Institute devoted to public uses—the Great Court, the Library, the Museum, the Auditorium, the Gymnasium, and several of the departments.

The Entrance-hall, the Great Court, the Library, the Museum, and the Auditorium occupy the first floor. The Gymnasium is in the fourth story. The administration offices are on the first floor, opening from the Entrance-hall.

In the second and third stories are located the following departments, each with a group of rooms adapted to its own purposes: Science (Chemical and Physical laboratories and lecture-rooms), Mechanic Arts, Commerce and Finance, Mechanical Drawing, Decoration and Design, Library School, English Language and Literature, Domestic Science, Junior Domestic Science and Arts.

The technical shops connected with the courses in Engineering, Mechanic Arts, and Machine Construction are in the basement, in which are placed also two of the large Electrical Laboratories.

EAST HALL

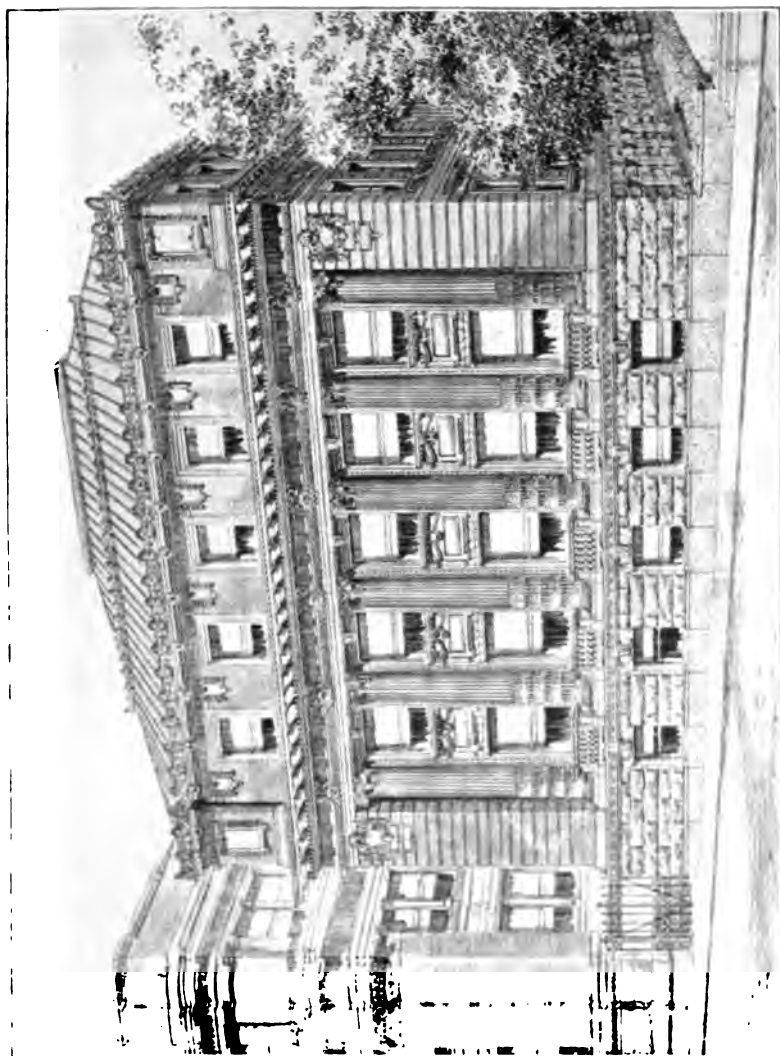
To meet the growing requirements of the Institute, this building, located on Chestnut street directly east

of the Main Building, was erected in 1902. It is four stories high, two hundred feet long and sixty-five feet wide, extending from Chestnut street to Ludlow street. The ground on which it stands was a gift from Mr. James W. Paul, Jr., President of the Board of Trustees. East Hall is connected by the Lobby and enclosed galleries with the Main Building; the Great Court, the Auditorium, the Library, and the Museum thus being retained as the central features of the Institute.

With the exception of the space devoted to the Lecture-room and the Picture Gallery, East Hall is occupied wholly by classrooms, department lecture-rooms, laboratories, and studios. The basement story is given up to the Electrical and the Mechanical Laboratories, the Forge-room, and the Foundry. On the first floor there is a range of classrooms, with the Lecture-room in the rear. The second floor contains the Department of Architecture and the Department of Domestic Arts. The third floor is occupied by studios of the Schools of Drawing, Painting, and Illustration, and by the Picture Gallery in the front pavilion.

THE ANNEX

The Annex is situated on Thirty-second street, immediately west of the Main Building. In it are located the Biological Laboratory, the Model Laundry, a number of rooms devoted to the work of the Domestic Science Department, and the Students Restaurant, the latter occupying the first floor.



EAST HALL.

15

THE GREAT COURT

Beyond the Entrance-hall in the Main Building is the Great Central Court, sixty-five feet square, extending the entire height of the building, and covered with a decorated ceiling, the centre of which is filled with stained glass. At the farther end of the court is the double marble stairway, ascending to the upper stories and descending to the Auditorium and to the workshops and laboratories in the basement. The stairway is flanked by a pair of magnificent bronze and gilt candelabra, supported by marble pedestals and fitted with electric lamps. Arcades support and enclose the broad galleries which run around the court on the second and third floors. From these galleries open the classrooms, laboratories, and studios, all of which are lighted from the exterior of the building. There is thus a free circulation of light and air throughout the entire building. The Portico, Entrance-hall, and Central Court are wainscoted in marble; the arcades are faced with enameled bricks, and the dividing cornices are of terracotta; the woodwork throughout the building is of polished oak.

THE AUDITORIUM

The Auditorium, located in the Main Building, is reached from the Great Court by the marble stairway, besides which there is an entrance on Thirty-second street. This hall seats fifteen hundred persons. On the stage is the grand organ, which, with the screen, is decorated in the style of the Italian Renaissance. Doorways lead from the stage, on both sides, to the retiring-rooms. Over one is the name of

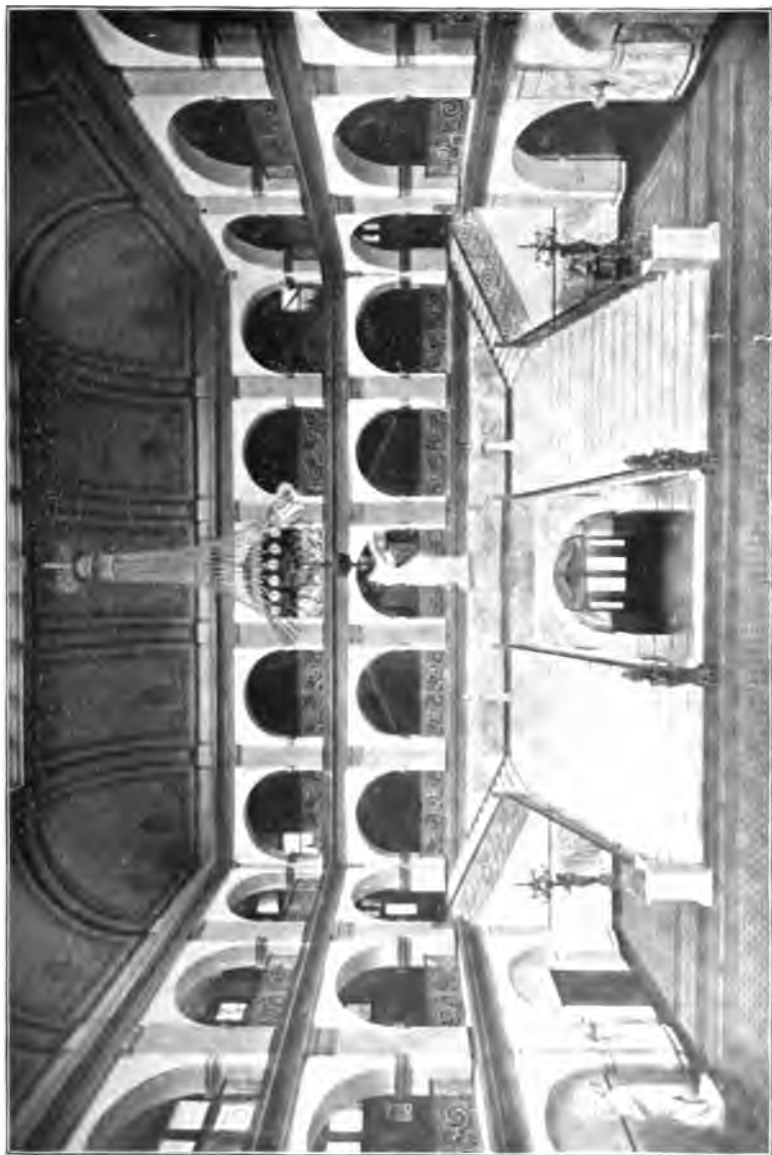
Bach, and above it is a scroll inscribed with a chord from one of his scores; a similar specimen of Händel's music ornaments the other doorway. On the south wall of the room, in the recessed arches, are inscribed the names of the great leaders of thought and culture: Aristotle, Dante, Michael Angelo, Shakespeare, Beethoven, Washington, Gutenberg, Galileo, Franklin, Watt, and Darwin.

THE LECTURE-ROOM

The Lecture-room, which is on the first floor of East Hall, is reached through the Lobby opening from the Great Court. It is a well-proportioned room, sixty-five feet long and forty-three feet wide, and is lighted on three sides by transom windows. It seats with comfort four hundred persons, and is used for lectures to students and for the smaller audiences attending the public lectures.

THE LOBBY

The Lobby is a spacious passage-way connecting the Main Building and East Hall. It is practically an extension of the Museum, and contains the valuable collection of Hand-Printed Indian Cloths; the important representative collection of European Textiles belonging to the period from the fourteenth to the eighteenth century; the view of the Façade of the Church of San Marco, constructed from the series of chromo-lithographic plates belonging to the great work on that building published by Ongania at Venice, and forming a picture eight feet long by six feet high; besides other objects of interest.



VIEW OF THE GREAT COURT.



LIBRARY AND READING-ROOM

On the first floor of the Main Building, opening from the Entrance-hall, are the Library and Reading-room and the Museum.

The Library and Reading-room is a fine apartment one hundred and twenty feet long by sixty feet wide. It contains thirty-one thousand volumes, and is supplied with the leading American and European periodicals relating to art, science, and technology.

THE PICTURE GALLERY

The Picture Gallery is in East Hall. The gallery is a large, well-lighted room, and is open to the public as well as to the students of the Institute. It contains The John D. Lankenau Collection and The Anthony J. Drexel Collection of paintings.

The John D. Lankenau Collection was bequeathed to the Institute in 1901. This collection is especially interesting because of the examples of the modern German masters. Among the painters represented are: Andreas Achenbach, Oswald Achenbach, Brandt, Dücker, Gebler, Grützner, Heilbuth, Knaus, Koekkoek, Lauenstein, Lessing, Preyer, Salentin, Schreyer, Corot, Daubigny, Diaz, Dupré, Jimenez, and Ziem. There are also interesting copies of paintings by Raphael, Carlo Dolci, and Andrea del Sarto.

The Anthony J. Drexel Collection comprises the paintings bequeathed to the Institute by its founder. In this collection are found examples of the work of Meissonier, Bouguereau, Jules Stewart, Coignard, Dupray, Cesar de Cock, Boldini, Rico, Michetti,

Madrazo, Jimenez, Ectisquisa, Van Marcke, Gierynski, Ridgway Knight, Richards, Hamilton, and others.

THE MUSEUM

The collections of the Museum embrace specimens in every department of industrial art. The decorative arts of Egypt, India, China, Japan, and Europe are well represented. The Egyptian collection is fully representative, and embraces sarcophagi, wood-carving, bronzes, glass, textiles, and coins.

THE GYMNASIUM

The Gymnasium, in the fourth story of the Main Building, is a large, airy, and well-lighted apartment, and is entered by hallways on the third floor. Connected with the entrances to the Gymnasium are the bath-rooms, fitted with marble compartments and supplied with hot and cold water. Lockers, coat-rooms, and lavatories are placed in all four stories of the building.

HEATING, LIGHTING, AND VENTILATION

In the basement of the Main Building are the extensive steam, mechanical, and electric plants, which supply all the buildings of the Institute.

Great attention has been paid to the heating and ventilation of the buildings. They are lighted throughout with electricity. The Main Building is fitted with the Johnson self-regulating heating apparatus, which secures an equable temperature at all times throughout the court, corridors, lecture-rooms, classrooms, studios, laboratories, and technical shops.

DEPARTMENTS

I. DEPARTMENT OF FINE AND APPLIED ART.

School of Illustration.

School of Drawing, Painting, and Modeling.

School of Design and Decoration.

School of Architecture.

II. DEPARTMENT OF SCIENCE AND TECHNOLOGY.

School of Electrical Engineering.

School of Mechanic Arts.

Course in Mechanical Drawing.

Course in Machine Construction.

Special Courses in Science: Mathematics, Physics, Chemistry.

III. DEPARTMENT OF COMMERCE AND FINANCE.

School of Commerce and Accounts.

Commercial Course for Teachers.

Office Courses: Secretary, Bookkeeping, Stenography.

IV. DEPARTMENT OF DOMESTIC SCIENCE.

Courses in Household Science and Economics.

Normal Course in Domestic Science.

V. DEPARTMENT OF DOMESTIC ARTS.

Courses in Dressmaking.

Courses in Millinery.

Normal Course in Domestic Arts.

VI. DEPARTMENT OF JUNIOR DOMESTIC SCIENCE
AND ARTS.

Regular Course.

Advanced Elective Courses.

VII. THE LIBRARY SCHOOL.

VIII. SPECIAL COURSES IN ENGLISH LANGUAGE AND
LITERATURE.

IX. DEPARTMENT OF PHYSICAL TRAINING.

X. DEPARTMENT OF EVENING COURSES.

XI. DEPARTMENT OF FREE PUBLIC LECTURES AND
CONCERTS.

XII. DEPARTMENT OF EVENING CLASSES IN CHORAL
MUSIC.

XIII. LIBRARY AND READING-ROOM.

XIV. MUSEUM AND PICTURE GALLERY.

While each department is organized with reference to its special objects and courses of instruction, it sustains important relations to the other departments, and the various lines of work are carried on in so broad a spirit as to give a certain unity of purpose to the scope and ends of the institution as a whole.

BOARD OF TRUSTEES

President,

JAMES W. PAUL, JR.

Treasurer,

ANTHONY J. DREXEL

Secretary,

GEORGE C. THOMAS

Assistant Treasurer,

HERMAN DERCUM

Until Third Thursday in October, 1904

JAMES C. BROOKS,

ARTHUR E. NEWBOLD,

ALEXANDER W. BIDDLE, M. D.,

GEORGE I. MC LEOD, M. D.,

ADDISON B. BURK,

ALEXANDER VAN RENSSELAER,

JOHN R. DREXEL,

WALTER GEORGE SMITH.

Until Third Thursday in October, 1905

JOSEPH MOORE, JR.,

HERBERT M. HOWE, M. D.,

GEORGE W. C. DREXEL,

THEODORE N. ELY,

CHARLES E. ETTING,

N. DUBOIS MILLER,

J. DUNDAS LIPPINCOTT,

ALLEN EVANS.

Until Third Thursday in October, 1906

REV. W. B. BODINE, D. D.,

JOSEPH G. ROSENGARTEN,

ANTHONY J. DREXEL,

EDWARD T. STOTESBURY,

RICHARD C. DALE,

GEORGE C. THOMAS,

JAMES W. PAUL, JR.,

JOHN LOWBER WELSH,

President of the Institute,

JAMES MAC ALISTER, LL. D.

ADVISORY BOARD OF WOMEN

President,

MRS. ALEXANDER VAN RENSSELAER

Secretary,

MISS MARY DULLES

Until last Tuesday in October, 1904

MRS. ALEXANDER W. BIDDLE,	MRS. GEORGE W. C. DREXEL
MRS. J. BELLANGEE COX,	MISS MARY DULLES,
MRS. PAUL D. MILLS.	

Until last Tuesday in October, 1905

MRS. ANTHONY J. DREXEL,	MRS. JOHN R. DREXEL,
MRS. C. HOWARD CLARK, JR.,	MRS. E. D. TOLAND,
MRS. J. G. WATMOUGH.	

Until last Tuesday in October, 1906

MRS. ALEX. VAN RENSSELAER,	MRS. GEORGE W. CHILDS,
MRS. EUGENE ELLICOTT,	MRS. CHARLES E. DANA,
MRS. ROBERT K. CASSATT.	

OFFICERS OF INSTRUCTION AND ADMINISTRATION

JAMES MAC ALISTER, LL. D.,
President of the Institute.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

LIEUTENANT WILLIAM L. BAILIE, U. S. N.,
Director of the School of Mechanic Arts, and
Professor of the Theory and Practice of the
Steam-Engine.

CHARLES ~~XXXXXXXXXXXX~~ HENRY V. GUMMERE, B. S., M. A.
Professor of Mathematics.

ALBERT P. BRUBAKER, M. D.,
Professor of Physiology and Hygiene.

ARTHUR J. ROWLAND,
Professor of Electrical Engineering.

HOMER J. HOTCHKISS, A. M., M. M. E.,
Professor of Physics.

PARKE SCHOCH, A. M.,
Director of the Department of Commerce and
Finance; and Professor of the History and
Mechanism of Commerce, and of Stenogra-
phy.

CLIFFORD P. GRAYSON,
Director, and Professor in charge of the Paint-
ing and Life Classes.

B. WEST CLINEDINST, N. A.,
Professor in charge of the School of Illustration.

ARTHUR TRUSCOTT,
Professor of Architecture.

16 OFFICERS OF INSTRUCTION AND ADMINISTRATION

A. THEODORE BRUEGEL, M. E., M. M. E.,

Professor of Mechanical Engineering.

HARRIET L. MASON,

Professor of English Language and Literature.

JAMES L. WOOD,

Instructor in Drawing from the Antique and
in Artistic Anatomy, and Lecturer on the
History of Art.

THOMAS SMITH, B. S., M. E.,

Professor of Mechanical Drawing.

ABRAHAM HENWOOD, B. S.,

Assistant Professor of Chemistry.

HOWARD S. RICHARDS, B. S.,

Professor of Building Construction.

JOHN J. DULL,

Professor of Architectural Drawing and Design.

EMIL LORCH, A. M.,

Assistant Professor of Architecture.

ALICE J. MORSE,

Director of the School of Design and Decora-
tion.

ALICE M. BRENNAN,

Director of the Junior and Elective Courses in
Domestic Science and Arts, and Instructor
in English.

HELEN M. SPRING,

Director of the Courses in Domestic Science.

CAROLINE A. M. HALL,

Director of the Courses in Dressmaking.

EMILY G. SWETT,

Director of the Courses in Millinery.

JOHN J. MAENE,

Instructor in Modeling and Wood-Carving.

KATHARINE D. BROWN, B. S.,

Instructor in Mathematics.

OFFICERS OF INSTRUCTION AND ADMINISTRATION 17

- MARTHA G. ALLEN,
Instructor in Mathematics.
- CHARLES D. CLARKSON,
Professor of the Theory and Practice of Accounts.
- CARL LEWIS ALTMAIER,
Professor of Commercial Law, and Instructor in Correspondence and Typewriting.
- JOHN T. HOLDSWORTH, Ph. B.,
Professor of Political Science and Banking.
- WILLIAM G. HAIMES,
Professor of Spanish.
- WILLIAM B. CREAGMILE,
Assistant Professor of Electrical Engineering.
- VICTOR T. WILSON, M. E.,
Instructor in Mechanical Engineering.
- HOWARD D. HESS, M. E.,
Instructor in Mathematics and Machine Design.
- FLOYD K. RICHTMYER, A. B.,
Instructor in Physics.
- CAROLYN H. LOCKE,
Instructor in Stenography.
- ALICE ELIZABETH CHASE, B. A.,
Instructor in English and History.
- LILLIAN M. DALTON,
Instructor in English.
- RUTH COLLINS,
Instructor in English.
- ELIZABETH L. BLOOMFIELD,
Instructor in Drawing.
- HÉLÈNE ZOGBAUM,
Instructor in Design in the Dressmaking and Millinery Courses.

18 OFFICERS OF INSTRUCTION AND ADMINISTRATION

MAUDE G. HOPKINS,

Director of Physical Training.

J. PETERSON RYDER, S. B.,

Director of Physical Training.

EDWARD P. SIMON,

Instructor in Architectural Drawing.

HOWARD H. DENN,

Instructor in Mechanical Drawing.

EDWIN CLARK,

Instructor in Building Construction.

THOMAS McCREIGHT,

Instructor in Forging.

R. WILLETTE CLINGER,

Instructor in Woodwork.

CLEMENT E. MOSSOP,

Instructor in Machine Construction.

BLAIR N. REILEY,

Instructor in charge of the Evening Courses in
Mechanical Drawing.

ROLAND W. WHITE,

Instructor in Chemistry

MARY E. FRATZ,

Instructor in Drawing.

_____,

Secretary of the Art Department.

MARGARET C. LIMERICK,

Instructor in Household Economics.

HARRIET P. MITCHELL,

Instructor in Bacteriology and Household
Economics.

EMMA SMEDLEY,

Instructor in Household Economics.

MARY L. SARGENT,

Instructor in Dressmaking.

OFFICERS OF INSTRUCTION AND ADMINISTRATION 19

- MARY E. EASTWOOD,
Instructor in Dressmaking.
- JENNIE COLLINGWOOD,
Instructor in Dressmaking.
- MARY HENLEIGH BROWN,
Instructor in Sewing.
- LAURA E. WAGNER,
Instructor in Dressmaking.
- CORA FOX,
Instructor in Millinery.
- SOPHIA A. GLOECKNER,
Instructor in Millinery.
- MARY C. DAVIS,
Instructor in Dressmaking.
- NELLIE M. LOTZ,
Instructor in Millinery.
- KATHARINE Mc COLLIN,
Instructor in Cookery.
- H. J. BUR,
Instructor in Mechanical Drawing.
- EDWARD C. MOORE,
Instructor in Mechanical Drawing.
- FRANK T. WEILER,
Instructor in Mechanical Drawing.
- CHARLES E. BONINE,
Instructor in Electrical Engineering.
- WILLIAM D. FORSTER,
Instructor in Electrical Engineering.
- GEORGE A. PIERCE,
Instructor in Electrical Engineering.
- W. B. HODGE,
Instructor in Electrical Engineering.
- HERBERT R. ROWLAND,
Instructor in Electrical Engineering.

20 OFFICERS OF INSTRUCTION AND ADMINISTRATION

R. M. BOYKIN,

Instructor in Electrical Engineering.

GEORGE A. HUGGINS,

Instructor in Mathematics.

MURRAY U. GROSS,

Instructor in Bookkeeping.

GEORGE A. GRACEY,

Instructor in Mathematics.

CLYDE WAGNER,

Mechanician to the Engineering Laboratories.

ELLA K. SCHOCH,

Instructor in Stenography.

CHARLES M. SCHMITZ,

Director of Music.

JAMES M. DICKINSON,

Organist.

LIBRARY

ALICE B. KROEGER,

Librarian, and Director of the Library School.

ELLA R. SELIGSBERG, B. A., B. L. S.,

Assistant Librarian, and Instructor in the
Library School.

FANNIE S. MATHER,

Assistant Librarian, and Instructor in the
Library School.

CHARLOTTE KENNEDY HANNUM,

Assistant in charge of the Circulating Department.

OFFICERS OF INSTRUCTION AND ADMINISTRATION 21

EMMA L. HELLINGS,

Evening Assistant in the Circulating Department.

LUCY MACKY,

Library Attendant.

MUSEUM

MARY T. MAC ALISTER,

Curator of the Museum.

OFFICES

FRANCES J. DILL,

Registrar.

MARY HEY SHAFFNER,

Clerk, Registrar's Office.

HELEN W. HOOPER,

Clerk, Registrar's Office.

ADELE MILLICENT SMITH,

President's Secretary.

CARRIE M. NELSON,

Clerk in charge of the Supply-room.

CARRIE MARTZ,

Superintendent of the Students Restaurant.

BUILDINGS

WILLIAM A. FLETCHER,

Chief Engineer and Superintendent of Buildings.

ROBERT J. McGOWAN,

Janitor.

DEPARTMENTS
AND
COURSES OF INSTRUCTION

DEPARTMENTS
AND
COURSES OF INSTRUCTION

DEPARTMENTS

The Institute is organized in the following Departments and Courses:

I. DEPARTMENT OF FINE AND APPLIED ART

School of Illustration.

School of Drawing, Painting, and Modeling.

School of Design and Decoration.

School of Architecture.

II. DEPARTMENT OF SCIENCE AND TECHNOLOGY

School of Engineering. A Course in Electrical and Mechanical Engineering.

School of Mechanic Arts. Systematic Course in Mathematics, Mechanical Drawing, Free-hand Drawing, Chemistry, Physics, English Language and Literature, History, Civics, Shopwork in Wood and Iron, Applied Electricity.

Course in Mechanical Drawing.

Course in Machine Construction.

SPECIAL COURSES IN SCIENCE

Mathematics: Algebra, Geometry, Mechanics, Trigonometry, Analytical Geometry, Surveying, Calculus.

Theoretical and Practical Physics.

Chemistry: General Chemistry, Qualitative and Quantitative Analysis, Organic Chemistry, Foods and Dietetics, Chemistry of Textiles.

III. DEPARTMENT OF COMMERCE AND FINANCE

School of Commerce and Accounts.

Commercial Course for Teachers.

Office Courses: Secretary, Bookkeeping, Stenography.

IV. DEPARTMENT OF DOMESTIC SCIENCE

Courses in Household Science and Economics.

Normal Course in Domestic Science.

V. DEPARTMENT OF DOMESTIC ARTS

Courses in Dressmaking.

Courses in Millinery.

Normal Course in Domestic Arts.

VI. DEPARTMENT OF JUNIOR DOMESTIC SCIENCE AND ARTS

Systematic Course for Young Women, embracing English Language and Literature, Mathematics, General Chemistry, Physiology and Hygiene, General History, English History, Free-hand Drawing, Business Customs and Accounts, Principles and Practical Training in Domestic Science and Arts.

Advanced Elective Courses in the foregoing subjects.

VII. THE LIBRARY SCHOOL

Systematic Course in the Theoretical and Practical Training of Librarians.

VIII. COURSES IN ENGLISH LANGUAGE AND LITERATURE

Rhetoric, Prose Style, American Literature, English Literature, Contemporary Poets, Victorian Poets.

IX. DEPARTMENT OF PHYSICAL TRAINING

Institute Classes for Students.

Special Courses for Young Women.

X. DEPARTMENT OF EVENING COURSES

Special Courses in all the Departments of the Institute.

One session.

Systematic Courses extending over two and three years, for which certificates are granted.

The Evening Session begins October 1st and closes March 31st.

XI. DEPARTMENT OF FREE PUBLIC LECTURES AND CONCERTS—DURING THE WINTER MONTHS

Afternoon and Evening Courses of Lectures in Art, Science, History, Literature, Technology, etc.

Weekly Organ Recitals and Concerts.

**XII. FREE EVENING CLASSES IN CHORAL MUSIC—
FROM OCTOBER 1ST TO MARCH 31ST**

The Drexel Chorus. Advanced Training in Oratorio Music.

The Choral Class. General Training in Choral Music.

XIII. LIBRARY AND READING-ROOM

The Library contains 31,000 volumes. Open free to the public, daily, except on Sundays and legal holidays.

XIV. MUSEUM AND PICTURE GALLERY

The Museum contains valuable and important collections of textiles, wood-carvings, metal-work, ceramics, casts, drawings, and prints.

The Picture Gallery contains The John D. Lankenau Collection and The Anthony J. Drexel Collection of paintings.

The Museum and the Picture Gallery are open free to the public, daily, except on Sundays and legal holidays, from 9 a. m. to 4 p. m., and on stated evenings during the winter months.

While some of the courses are especially designed for either young men or young women and are quite distinct in their arrangement and management, all the general courses are open to both sexes, on the same terms and conditions.

The academic year is divided into two terms, beginning, respectively, in September and February.

DEPARTMENT OF FINE AND APPLIED ART

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

CLIFFORD P. GRAYSON,
Director, and Professor in charge of the Painting
and Life Classes.

B. WEST CLINEDINST, N. A.,
Professor in charge of the School of Illustration.

JAMES L. WOOD,
Instructor in Drawing from the Antique, Artistic
Anatomy, and the History of Art.

ARTHUR TRUSCOTT,
Professor in charge of the Courses in Architecture.

EMIL LORCH, A. M.,
Assistant Professor of Architecture.

ALICE J. MORSE,
Director of the Courses in Design and Decoration.

JOHN J. MAENE,
Instructor in Modeling in Clay and Wood-Carving.

HOWARD S. RICHARDS, B. S.,
Professor of Building Construction.

JOHN J. DULL,
Professor of Architectural Drawing and Design.

ELIZABETH L. BLOOMFIELD,
Instructor in Drawing.

HÉLÈNE ZOGBAUM,
Instructor in Design in Dressmaking and Milli-
nery.

MARY E. FRATZ,
Instructor in Drawing.

Secretary of the Department.

The Department is organized, as follows:

SCHOOL OF ILLUSTRATION.

SCHOOL OF DRAWING, PAINTING, AND MODELING.

SCHOOL OF DESIGN AND DECORATION.

SCHOOL OF ARCHITECTURE.

SCHOOL OF ILLUSTRATION

B. WEST CLINEDINST, N. A., Professor in charge.

The School of Illustration comprises the following classes:

I. MORNING CLASS.—LIFE CLASS STUDYING FROM THE DRAPED AND COSTUMED MODEL. The model poses from 9 a. m. until 12 m. The model and costume are changed each week.

II. AFTERNOON CLASS.—From 1 to 4 p. m. In this class the model poses in costume different in character from that of the Morning Class.

In both the Morning and the Afternoon Class, instruction is given in the various mediums in black and white adapted to the purposes of illustration, and to reproductive work in general, such as drawing, painting in oil, wash, pen and ink, crayon, charcoal, and pencil. Special attention is given to advancing the student in the more practical mediums of wash and pen drawing.

III. COMPOSITION CLASS.—CRITICAL LECTURES IN PRACTICAL ILLUSTRATION. Wednesday of each week, from 3 to 4 p. m.

These lectures are for the purpose of instructing the student in composition and costume, and in the necessary requirements for converting the study of the draped or costumed model into a finished picture.

IV. WATER-COLOR CLASS.—From 9 a. m. to 12 m., daily. A class in connection with the Morning Illustration Class is instructed by Mr. Clinedinst in Water-Color, from the costumed model and accessories. The number of students that can be received is limited.

The fee admits to all the privileges of the Life Classes in the Art Department.

V. SKETCH CLASS FROM THE COSTUMED MODEL.—This class meets on Thursday of each week, from 3 to 4 p. m. The class is open to students who are not members of other classes in the Institute.

REQUIREMENTS FOR ADMISSION

MORNING OR AFTERNOON CLASS.—Applicants must submit satisfactory drawings or sketches of the draped or costumed model, or else an illustration that has been published in a book, a magazine, or an illustrated newspaper.

WATER-COLOR OR SKETCH CLASS.—Applicants must submit a drawing from the antique or a sketch from life.

FREE SCHOLARSHIPS

A limited number of free scholarships is offered to former students who have spent at least two years in the School of Illustration, and who, after leaving the school, have shown conspicuous ability in that department of art work. These scholarships are granted at

the discretion of the Faculty of the Art Department, and entitle the holders to admission to such classes as will furnish opportunity for further improvement.

SCHOOL OF DRAWING, PAINTING, AND MODELING

CLIFFORD P. GRAYSON, Director.

FIRST CLASS

DRAWING FROM GEOMETRIC SOLIDS.

CAST DRAWING FROM SIMPLE ORNAMENT.

FREE-HAND AND LINEAR PERSPECTIVE.—Lectures and problems.

DRAWING.—Still-life and interiors.

FREE-HAND SKETCHING FROM OBJECTS.

DRAWING FROM CASTS OF HANDS, FEET, AND SIMPLE MASKS.

CLAY MODELING.—Lines, symmetry, ornament.

SECOND CLASS

CAST DRAWING FROM COMPLICATED ORNAMENT.

DRAWING FROM CASTS OF PARTS OF HUMAN FIGURE AND ANIMALS.

ANTIQUE BUST AND TORSO.—Drawing and monochrome in oil.

ANTIQUE DRAWING.—Full-length figure.

DRAWING FROM LIFE.

SKETCHING FROM OBJECTS.—Pencil and crayon.

ARTISTIC ANATOMY.—Lectures and drawings.

CLAY MODELING.—Value of planes studied from casts of natural foliage and parts of human figure.

THIRD CLASS

DRAWING FROM FULL-LENGTH ANTIQUE.
DRAWING FIGURE FROM LIFE.
PAINTING FROM LIFE.—Head and costumed figure.
PAINTING IN OIL AND WATER-COLOR.—Still-life.
SKETCHING.—From costumed figure.
LECTURES ON COMPOSITION.
ARTISTIC ANATOMY.—Lectures and drawing.
CLAY MODELING.—Full-length figure, torso, and head,
from casts.
LECTURES ON THE HISTORY OF ART.

FOURTH CLASS

DRAWING FIGURE FROM LIFE.
PAINTING FROM LIFE.—Full figure.
PORTRAIT PAINTING.
COMPOSITION AND SKETCHING.
CLAY MODELING.—Bust, bas-relief, and full figure from
life.
LECTURES ON THE HISTORY OF ART.

The lectures on composition are given by Mr. Cline-
dinst.

It is expected that students will accomplish the work
of each class in one year. The year is divided into two
terms of nearly equal length.

On entering the school, each student is placed imme-
diately in the class for which he or she is best fitted, and
advancement thereafter is regulated by the judgment
of the instructors.

If, at the end of three terms, a student has not pro-
gressed sufficiently to enter the Antique Class, or if, at

the end of two terms, a student of the Antique Class is not prepared to enter the Life Class, he will be considered as lacking in either application or artistic ability, and may, at the discretion of the Faculty, be dropped from the class.

No definite time can be assigned for completing a course of training in art, but at the end of four years, or eight terms, a certificate is granted to students who have attended regularly and have done satisfactory work in the studies pursued. It should be understood, however, that any of the several lines of work in the Fourth Class may be carried as far as the successful achievement of the student warrants.

REQUIREMENTS FOR ADMISSION

FIRST CLASS.—Applications must be approved by the Director.

SECOND CLASS.—A drawing from a plaster mask or fragment of a figure.

THIRD CLASS.—One or more drawings made from the cast or other objects.

FOURTH CLASS.—Applicants are required to submit specimens of work from the antique or from life.

SPECIAL COURSES

Special students are admitted for the study of any of the subjects embraced in the above courses.

SATURDAY MORNING CLASSES

Classes for children and persons unable to attend during the week. The instruction includes two divisions:

1. BEGINNERS' CLASS.—Drawing from geometric solids; still-life and interiors; drawing from casts of hands, feet, and simple ornament.

2. ADVANCED CLASS.—Drawing from casts of parts of human figure and animals. Sketching from objects in pencil.

These classes are under the direction of Miss Elizabeth L. Bloomfield.

The instruction extends through one session, from November 1st to April 30th. The classes meet weekly on Saturday, from 9 a. m. to 12 m.

COURSE IN CLAY MODELING

This course is designed to give artistic training especially adapted to the needs of persons desirous of devoting themselves to the study of decorative sculpture in terra-cotta and stone as applied to buildings, and also to the needs of artificers and designers in silver, bronze, iron, and in other forms of industrial products to which modeled ornament is applicable.

While in other respects the course of training is similar to that in the School of Drawing, Painting, and Modeling, a considerable portion of the student's time is devoted to designs practically available in decorative work.

COURSE IN WOOD-CARVING

A practical course in wood-carving and its applications to the various forms of industrial production.

The course embraces a study of the nature and use of tools, elementary exercises in carving, ornament of

various kinds, original designs for panels, carved enrichments for furniture, frames, architectural decoration, etc.

For admission to this course, applicants should be proficient in free-hand drawing and elementary clay modeling.

Students who have not had this training divide their time between the classes in these branches and the work in carving.

Students have the privilege of attending the lectures on historic ornament and the architectural styles which are given at stated times during the year.

SCHOOL OF DESIGN AND DECORATION

This course is intended for the training of professional designers, and occupies three years. It provides thorough instruction in the principles of historic ornament and decorative design, and in the technical methods of their practical application to wall-paper, textiles, wood-work, metal-work, furniture, posters, book-covers, etc.

Full information concerning this school will be found on page 42.

SCHOOL OF ARCHITECTURE

A two-years' course in Free-hand Drawing, Ornament, the Orders of Architecture, Working Drawings, Perspective, Shades and Shadows, Sketching, Architectural Design, Measured Drawings, Planning of Buildings, Pen-and-Ink Rendering, Water-Color Rendering, Specifications and Contracts, with Lectures on the more

important technical subjects connected with architectural work.

Full information concerning this course will be found on page 48.

PHYSICAL TRAINING

Students enrolled in any of the Art courses have the privilege of attending the Institute classes in Physical Training twice a week without additional charge. The training is carried on under the immediate supervision of Miss Hopkins and Mr. Ryder, the Directors.

The studios and classrooms in all the schools and courses are open five days a week, from 9 a. m. to 4 p.m.

The lectures on Perspective and Artistic Anatomy, by Mr. James L. Wood, are given on Saturday mornings, at 9.30 o'clock.

The accommodations of the Art Department are ample, the various rooms and studios being fitted with every requirement and convenience for the different kinds of work pursued.

All the work done by the students is subject to the control of the department until the close of the term or school year.

The Institute reserves the right to retain at least one specimen of work done by each student of each class.

SCHOLARSHIPS

1. GRADUATE SCHOLARSHIPS.—A limited number of free scholarships is offered to students who have received the certificate which is awarded in the School

of Drawing, Painting, and Modeling, and who, after finishing the course, have shown conspicuous ability. These scholarships are granted at the discretion of the Faculty of the Art Department, and entitle the holders to admission to such classes as will furnish opportunity for further improvement.

2. **THE FRANCES DREXEL PAUL SCHOLARSHIP.**—Mr. James W. Paul, Jr., President of the Board of Trustees, has established an annual scholarship in memory of his wife, to be known as **THE FRANCES DREXEL PAUL SCHOLARSHIP**. The scholarship, which is of the value of one hundred dollars, may be given to one student or divided between two students; and, in the judgment of the Faculty, free tuition may be given in addition to the amount of money awarded. This scholarship is open to students who have spent at least two years in any course of the Art Department, and is awarded at the concours held at the end of each academic year.

PRIZES

1. **THE JOHN HENDERSON BETTS MEMORIAL PRIZE**, of the value of twenty-five dollars, founded by his wife, Mary Furman Betts, 1904, is awarded in the School of Illustration, at the end of each academic year, to the student having the highest average standing throughout the year in the Composition Class.

2. **THE ANTHONY J. DREXEL PRIZES** and **THE JOHN R. DREXEL PRIZES** are awarded in the Department of Fine and Applied Art, at the end of each academic year, and at the close of the session of the Evening

Classes. The prizes consist of sums of money divided among the several schools. They are given on the recommendation of juries selected by the Directors of the Art Department.

MUSEUM AND PICTURE GALLERY

The Art Department is supplied with an extensive collection of plaster casts, representative of the sculpture of the classic and Renaissance periods, and with valuable collections of drawings, designs, prints, and photographs. The collections of textiles, wood-carvings, metal-work, and ceramics in the Museum of the Institute are of great value in connection with the various lines of instruction. The Picture Gallery contains The John D. Lanckenau Collection and The Anthony J. Drexel Collection of paintings, in which are found examples of work by the leading artists of the German, French, Italian, Spanish, and other schools.

LIBRARY

In the Library of the Institute, which contains thirty thousand volumes, there is an extensive collection of valuable art and illustrated books arranged in a separate alcove, to which the students have free access.

The Reading-room is supplied with the leading art periodicals.

FEES AND TERMS

SCHOOL OF ILLUSTRATION

Morning Class and Critical Lectures, *twenty dollars* per term.

Afternoon Class and Critical Lectures, *twenty dollars* per term.

40 DEPARTMENT OF FINE AND APPLIED ART

Morning and Afternoon Classes and Critical Lectures, *twenty-five dollars* per term.

Critical Lectures, *ten dollars* per term.

Critical Lectures for members of the School of Drawing, Painting, and Modeling, *five dollars* per term.

Water-Color Class, *twenty-five dollars* per term.

The fee admits to all the privileges of the Life Classes in the Art Department.

Sketch Class, *five dollars* per term.

SCHOOL OF DRAWING, PAINTING, AND MODELING

First class, *twelve dollars* per term; second class, *twelve dollars* per term; third and fourth classes, *fifteen dollars* per term, each.

SPECIAL STUDENTS

In Water-Color, Oil Painting, Still-life, Drawing or Painting from Life, or Clay Modeling, *fifteen dollars* per term.

SATURDAY MORNING CLASS

Ten dollars per term.

COURSE IN CLAY MODELING

Fifteen dollars per term.

COURSE IN WOOD-CARVING

Wood-Carving only, *fifteen dollars* per term.

Wood-Carving with Drawing and Clay Modeling, *twenty dollars* per term.

There are two terms in the year, beginning, respectively, in September and February.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

A deposit of *fifty cents* is required of each student, as security for the return of the locker key. A deposit of *fifty cents* additional, as security for the return of the key of the locker in the gymnasium, is required of each student taking physical training.

A storage-room for bicycles, in the basement, is provided by the Institute, free of charge.

ADMISSION

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

EVENING CLASSES

The Evening Classes extend through six months of the year, from October to March, inclusive.

Instruction is given in the following subjects: Free-hand Drawing from the Cast, Drawing from the Antique, Drawing from Life, Modeling in Clay, Architectural Drawing, Building Construction, Design, Pen-and-Ink Rendering, Water-Color Rendering, Wood-Carving.

Full details of these classes will be found on page 228.

SCHOOL OF DESIGN AND DECORATION

INSTRUCTORS

ALICE J. MORSE, Director,
Design and Decoration.

EMIL LORCH, A. M.,
Architectural Styles.

ELIZABETH L. BLOOMFIELD,
Drawing.

CLIFFORD P. GRAYSON,
Figure Painting.

JOHN J. MAENE,
Modeling and Wood-Carving.

JAMES L. WOOD,
The History of Art.

JOHN J. DULL,
Water-Color Rendering.

R. WILLETTE CLINGER,
Joinery.

THOMAS MC CREIGHT,
Forging.

MAUDE G. HOPKINS and J. PETERSON RYDER, S. B.,
Directors of Physical Training.

The School of Design and Decoration is intended for the training of professional designers, and occupies three years. It provides thorough instruction in the principles of historic ornament and decorative design, and in the technical methods of their practical application to wall-paper, textiles, woodwork, metal-work, furniture, ceramics, book-covers, etc.

COURSE OF INSTRUCTION

JUNIOR YEAR

FIRST TERM

Study of drawing and color, from objects in the Museum, with special reference to the later work in actual design. Principles of design and composition. Perspective. Modeling. Physical training.

SECOND TERM

History of ornament. Lettering. Application of simple ornament to textiles, etc. Modeling. Physical training.

MIDDLE YEAR

FIRST TERM

History of ornament continued. Development of ornament and its adaptation to special forms and materials—textiles, wall-surfaces, inlay-mosaics, etc. Modeling. Wood-carving.

SECOND TERM

Designs for stencils, textiles (woven and printed), furniture, wrought-iron, brass, silver, pottery, china, book-covers, wall-papers, leather, posters, etc. Studies from nature in water-color. Principles of conventionalization. Lectures on the history of art. Wood-carving.

SENIOR YEAR

FIRST TERM

The work of this term is largely a continuation of that of the previous term, with the addition of the study of interior decoration as a whole. Studies from nature.

Lectures on the history of art and on stained glass. Wood-carving (optional).

SECOND TERM

Applied design—the making of designs which are salable and capable of reproduction and manufacture. Lectures on the history of art. Wood-carving (optional).

During this term, attention is given to rendering, as well as to the purely artistic side of the work.

Students may elect to spend a portion of this year in drawing from life and in the study of artistic anatomy.

Through the entire course the students make as many drawings and color-studies as possible, as an aid in working out the problems and as a means of cultivating their artistic and decorative sense.

GRADUATE COURSES

For students desirous of devoting more time to applied work in design and decoration than is possible in the regular course, graduate courses are provided in the following subjects:

THE DRAPED FIGURE WITH REFERENCE TO DECORATIVE PURPOSES.

WOOD-CARVING AND JOINERY.—Furniture, mantels, paneling, etc.

STAINED GLASS.—For ecclesiastical and domestic purposes.

HOUSE DECORATION.—Interiors, hangings, etc.

ARCHITECTURAL DECORATION.—Modeling of details for architectural work in terra-cotta, marble, etc.

ORNAMENTAL IRONWORK.—Grilles, railings, gates, knockers, etc.

In these courses, practical instruction is given in the studios and workshops, and designs in various materials are actually carried out by the students. The collections in the Museum are especially valuable in connection with the applied work. The studios and workshops afford ample opportunity for working out the designs.

The Class in the Draped Figure is intended to enable students to use decorative motives derived from the living model.

These courses are open to graduates of the regular course, and to other students who have had the necessary preparation in the principles of design, historic ornament, and practical designing.

PHYSICAL TRAINING

Students are required to attend the Institute classes in physical training twice a week during the first year of the course, and have the privilege of attending throughout the three years. No additional fee is charged.

DIPLOMA

A diploma is awarded to students who complete the regular course and pass all the required examinations.

SPECIAL COURSES

For those unable to devote the time required for the full course, Special Courses in Applied Design will be arranged in accordance with individual needs, provided such applicants have had previous experience in work of this kind, or are fitted to profit by the instruction.

ATTENDANCE

Students taking the regular course are required to attend from 9 a. m. until 4 p. m., from Monday to Friday, inclusive.

MUSEUM AND ART COLLECTIONS

Students have the advantage of carrying on their work in immediate connection with the Museum, which contains extensive collections representing the decorative arts of Egypt, India, China, Japan, and the countries of Europe. The collections of European textiles and of India printed cloths are worthy of special mention.

Besides these, there are collections of plaster casts, representative of the sculpture of the classic and Renaissance periods, and valuable collections of drawings, designs, prints, and photographs.

The Picture Gallery contains The John D. Lankenau Collection and the Anthony J. Drexel Collection of paintings.

LIBRARY

The Library, which contains thirty-one thousand volumes, is supplied with an extensive collection of

books in fine and applied art, embracing many important and valuable works on design and decoration. The best periodicals relating to these subjects are supplied in the Reading-room.

ADMISSION

A good general English education is advisable for students entering the school. Students under eighteen years of age are advised not to undertake the work. Some previous experience in the use of water-color is of advantage to students. All applicants must submit drawings of sufficient merit to warrant their admission to the school. The necessary preparatory training in drawing can be obtained in the School of Drawing, Painting, and Modeling, in the Institute.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEEES AND TERMS

Regular Course, *fifteen dollars* per term.

Graduate Course, *twenty dollars* per term.

A deposit of *fifty cents* is required of each student, as security for the return of the locker-key. A deposit of *fifty cents* additional, as security for the return of the key of the locker in the Gymnasium, is required of each student taking physical training.

There are two terms in the year, beginning, respectively, in September and February.

SCHOOL OF ARCHITECTURE

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

ARTHUR TRUSCOTT,
Professor of Architecture.

EMIL LORCH, A. M.,
Assistant Professor of Architecture.

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

THOMAS SMITH, B. S., M. E.,
Professor of Mechanical Drawing.

HARRIET L. MASON,
Professor of English Language and Literature.

ELIZABETH L. BLOOMFIELD,
Instructor in Drawing from the Cast.

ALICE ELIZABETH CHASE, B. A.,
Instructor in General History.

JOHN J. MAENE,
Instructor in Modeling.

JAMES L. WOOD,
Lecturer on The History of Art.

PROFESSOR ARTHUR J. ROWLAND,
Lecturer on Electrical Lighting.

PROFESSOR A. THEODORE BRUGEL,
Lecturer on Steam Heating.

PROFESSOR JOHN T. HOLDSWORTH, Ph. B.,
Lecturer on Business Customs.

R. WILLETTE CLINGER,
Instructor in Wood-turning.

J. PETERSON RYDER, S. B.,
Director of Physical Training.

The course of study in Architecture aims to give students such general training in drawing, design, decoration, and building construction as will enable them to become successful architectural draftsmen. This general artistic training is supplemented by the study of mathematics, general history, and English. The course, in fact, is extensive and thorough enough to equip students for professional work on their own account, after the necessary drill and experience which can only be obtained in an architect's office. While practical training is strongly emphasized, stress is laid upon the artistic and creative work of the students, and special attention is given to rendering in pen, pencil, and brush. The lectures on the history of architecture furnish a comprehensive knowledge of the development and growth of the various styles.

The course occupies two years, a large share of the time being devoted to purely architectural work.

COURSE OF INSTRUCTION

JUNIOR YEAR

FIRST TERM

ELEMENTS OF DESIGN.—The aim of this course is to develop the appreciation and the creative power of the student. The instruction is given by means of lectures on the principles of design, and illustrative exercises in line, form, and color.

ELEMENTS OF ARCHITECTURE.—Study of the orders, mouldings, etc.; rendering in wash.

SHADES AND SHADOWS.

PERSPECTIVE.—Lectures and exercises.

SKETCHING.

HISTORY OF ARCHITECTURE.—Egyptian, Assyrian, Persian, Greek, Roman, Early Christian. The evolution of the art of building is considered and the artistic achievement—composition, planning, decoration, etc.,—of each period is studied with reference to its structural methods, materials, and conditions. Illustrated.

HISTORIC ORNAMENT.—This subject is studied in connection with the History of Architecture, the ornament and decoration of each period being considered as a part of the contemporary architectural style.

BUILDING MATERIALS.—Kinds and qualities of materials used for building purposes.

BUILDING CONSTRUCTION.—Practical working drawings.

MATHEMATICS.—Review of arithmetic, giving special attention to decimals, ratio and proportion, percentage, square root, metric system, practical measurements. Elementary algebra through simple fractions.

ENGLISH.—Principles of composition and exercises in writing.

GENERAL HISTORY.—Greek history.

SECOND TERM

ELEMENTS OF DESIGN, continued.

STUDY OF THE ORDERS OF ARCHITECTURE, continued

PERSPECTIVE, continued.

SKETCHING, continued.

HISTORY OF ARCHITECTURE, continued.

HISTORIC ORNAMENT, continued.

GRAPHICAL STATICS.—Essential elements for practical work.

MATHEMATICS.—Algebra through quadratics, including only the simplest forms in simultaneous quadratics and radicals. Practical geometry.

ENGLISH.—Principles of composition and exercises in writing.

GENERAL HISTORY.—Roman and medieval history.

BUILDING LAWS.—The more important statutes on the subject.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

SENIOR YEAR

FIRST TERM

ARCHITECTURAL DESIGN.

DETAILING OF ORNAMENT.

MEASURED DRAWINGS from actual measurements of buildings.

CONSTRUCTIVE DESIGN, APPLIED STATICS, STRENGTH OF MATERIALS, with laboratory work.

HISTORY OF ARCHITECTURE—Romanesque, Byzantine, Gothic, Renaissance, Modern. Illustrated.

SKETCHING.

MATHEMATICS.—Essentials of plane trigonometry, including drill in the use of logarithmic tables and the solution of right and oblique triangles. Practical geometry and mensuration.

HISTORY.—Modern European history.

SPECIFICATIONS.—General review of the construction and finishing of buildings.

SECOND TERM

ARCHITECTURAL DESIGN.

DETAILING OF ORNAMENT, continued.

CONSTRUCTIVE DESIGN, continued.

HISTORY OF ARCHITECTURE, continued.

WATER-COLOR RENDERING.

PEN AND INK RENDERING.

MATHEMATICS.—Elementary mechanics. Elements of plane surveying and leveling—recitation and field-work.

SPECIFICATIONS. CONTRACTS. ESTIMATES.

ELECTRICAL LIGHTING.—Specially related to buildings.

HEATING AND VENTILATING.—Principles and practice.

BUSINESS FORMS AND CUSTOMS.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

Students attend five days a week, from 9 a. m. to 5 p. m., with an hour's recess in the middle of the day.

The equipment of the department includes: casts of ornament, orders, building materials, hardware, etc.; an Olsen testing-machine, arranged for tensile, compressive, and transverse tests; and a cement testing-machine.

As occasion requires, visits are made to important buildings, to illustrate the practical application of principles presented in class.

DIPLOMA

A diploma is granted to students who complete the course and pass all the required examinations.

GRADUATE COURSE

For students desirous of devoting more time to preparation for actual work, a Graduate Course of one year is provided. This course embraces advanced work in the following subjects:

ARCHITECTURAL DESIGN.

CONSTRUCTIVE DESIGN.

DESIGN AND DETAILING OF ORNAMENT.

APPLIED STATICS.

RENDERING IN PENCIL, BRUSH, AND PEN.

STRENGTH OF MATERIALS.—Laboratory work.

DETAILING.—Office practice.

SPECIFICATIONS.

PAPERS IN ARCHITECTURAL HISTORY.

ELECTIVE WORK IN ADVANCED MATHEMATICS.

ENGLISH LANGUAGE AND LITERATURE.—Elective.

CLAY MODELING

A special certificate is granted to students who complete satisfactorily the Graduate Course.

GYMNASIUM

The Gymnasium is a large, airy room completely equipped in accordance with the requirements of the Swedish system of physical training and with dressing-rooms, and bath-rooms supplied with hot and cold water. All the training is conducted under the immediate supervision of the Director.

SCHOOL OF ARCHITECTURE

LIBRARY AND MUSEUM

In the Library, which contains thirty-one thousand volumes, there is an extensive collection of valuable and important works on architecture. The leading periodicals relating to the subject are supplied in the Reading-room.

The collections in the Museum afford ample opportunity for the study of the industrial arts allied to architecture. The decorative arts of Egypt, India, China, Japan, and Europe are well represented.

ADMISSION

For admission, applicants must have a high school education or its equivalent. The examination includes English grammar and composition, arithmetic, and United States history; applicants must be proficient also in mechanical and freehand drawing. The necessary preparatory training in drawing can be obtained in other departments of the Institute. Entrance examinations are held in June and September.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Regular Course, *thirty dollars* per term. Graduate Course, *thirty-five dollars* per term.

Students provide their own drawing instruments, text-books and stationery.

Coat-lockers, with individual combination locks, giving students the absolute control of their own

property, are supplied in the main building at a rental of *fifty cents* per term for each student.

There are two terms in the year, beginning, respectively, in September and February.

EVENING COURSES

In the Evening Courses, systematic instruction is given in Architectural Drawing and Design, Building Construction, and House Construction.

The session extends through six months, from the beginning of October to the end of March.

FEES.—From *four dollars* to *seven dollars*, according to the course taken, for the entire session of six months.

Full details of these courses will be found on page 229.

DEPARTMENT OF SCIENCE AND TECHNOLOGY

SCHOOL OF ELECTRICAL ENGINEERING

The School of Electrical Engineering offers unusual facilities for instruction in this important department of scientific and technical training. The growing importance of the subject and the constantly increasing number of its applications are opening up new opportunities for young men in various lines of work. The course is designed to make the instruction both thoroughly scientific and practical. For this purpose, the laboratories have been equipped with the newest forms of apparatus and every appliance necessary for efficient training. No attempt is made to teach pure science, except in connection with its applications to engineering; the special object in view being to fit young men creditably to occupy useful and important positions in which immediate and practical use can be made of their knowledge of engineering.

While the training is essentially technical, certain subjects indirectly related to engineering matters are included in the curriculum. The student's use of English in the written matter submitted by him in connection with the Laboratory and Seminary work is carefully supervised all through the course. A course in Business Methods is provided, which introduces the student to a knowledge of such business affairs as he will be sure to encounter no matter what position he may be called to fill in after life. The Seminary work

is intended chiefly to broaden the scope of the course by acquainting the student with current engineering literature and with the most recent developments of the science.

Philadelphia, as one of the greatest centres of manufacturing industry in the world, offers wide opportunity to become familiar with the varied developments of modern engineering. Use is made of the advantages thus afforded, to inspect power plants and manufacturing establishments, and to make occasional tests of the machinery installed in them.

As scheduled below, a course of three years is prescribed for the School of Electrical Engineering. It should be understood, however, that but two years, the Junior and the Senior, are required for the strictly Engineering course of study and training.

The diploma of the School of Mechanic Arts in the Institute admits students to the Junior Year of the School of Engineering.

Advanced standing may be taken also by applicants having the necessary qualifications.

The Preparatory (First) Year is intended for students who do not hold the diploma of the School of Mechanic Arts, coming from high schools, manual training schools, or secondary technical schools, but who are not sufficiently prepared in the mathematics, science, drawing, and shopwork required to enter fully upon the work of the Junior Year.

It is essential that applicants for admission to the Preparatory Year should have a knowledge of Algebra through quadratics, Plane Geometry, Chemistry,

Physics, and such English branches as are generally given in high and manual training schools. Instead of the mathematics, some acquaintance with mechanical drawing and shopwork in wood and iron will be accepted.

The full schedule of studies for the Preparatory Year includes more work than can be accomplished in one year. Each applicant is considered with reference to his individual attainments and needs, and the amount of work assigned to him is dependent upon his previous education or experience.

No formal examination for admission is required, but applicants must furnish evidence of their fitness to undertake the prescribed work, either by credentials from approved schools, or by examination in any branch not sufficiently covered by the credentials. Due account will be taken of the maturity of the student, and of any practical experience he may have had in scientific or mechanical training related to the subjects specified in the schedule of the Preparatory Year.

The School of Mechanic Arts in the Institute, aside from its value in furnishing a complete secondary course of education, offers the best opportunity to younger applicants to prepare themselves for admission to the Junior Year of the School of Electrical Engineering.

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

ARTHUR J. ROWLAND,
Professor of Electrical Engineering.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

A. THEODORE BRUEGEL, M. E., M. M. E.,
Professor of Mechanical Engineering.

HOMER J. HOTCHKISS, A. M., M. M. E.,
Professor of Physics.

ABRAHAM HENWOOD, B. S.,
Assistant Professor of Chemistry.

WILLIAM B. CREAGMILE,
Assistant Professor of Electrical Engineering.

VICTOR T. WILSON, M. E.,
Instructor in Mechanical Engineering.

HOWARD D. HESS, M. E.,
Instructor in Mathematics and Machine Design.

FLOYD K. RICHTMYER, A. B.,
Instructor in Physics.

CLEMENT E. MOSSOP,
Instructor in Machine Construction.

R. WILLETTE CLINGER,
Instructor in Woodwork and Pattern-making.

60 SCHOOL OF ELECTRICAL ENGINEERING

THOMAS McCREIGHT,
Instructor in Forging.

CLYDE WAGNER,
Mechanician to Engineering Laboratories.

OFFICERS OF OTHER DEPARTMENTS GIVING INSTRUCTION
IN THE SCHOOL OF ENGINEERING

H. L. MASON,
Professor of English Language and Literature.

ARTHUR TRUSCOTT,
Lecturer on Building Construction.

JOHN T. HOLDSWORTH, Ph. B.,
Lecturer on Business Methods.

COURSE OF INSTRUCTION

PREPARATORY (FIRST) YEAR

SUBJECT	Scheduled hours per week		
	Lab'y, Shop or Drawing	Rec't'n or Lecture	Total No. of Hours
FIRST AND SECOND TERMS			
Mathematics—Higher Algebra, Geometry, Trigonometry, Mechanics	—	5	5
Chemistry I—General Chemistry ..	3	2	5
Physics II	3	3	6
Mechanical Drawing	9	—	9
Lettering	1	—	1
Machine Shop	9	—	9
Forging	4	—	4
Woodworking and Pattern Shop ..	5	—	5

The time scheduled above is subject to such changes as may be required by the needs of individual students.

JUNIOR YEAR

SUBJECT	Scheduled hours per week		
	Lab'y or Drawing	Rec't'n or Lecture	Total No. of Hours
FIRST TERM			
Mathematics—Calculus	—	5	5
Chemistry II—Qualitative Analysis	3	1	4
Physics III	3	2	5
Electricity—General Theory	—	3	3
Materials of Engineering	—	1	1
Steam-Boilers	—	2	2
Principles of Mechanism	3	1	4
Electrical Engineering Laboratory	3	—	3
Mechanical Engineering Laboratory	3	—	3
English, one hour bi-weekly	—	—	—
Engineering Seminary, bi-weekly ..	—	—	—
	15	15	30
SECOND TERM			
Mathematics—Calculus	—	5	5
Chemistry III—Technical Chemis- try	3	—	3
Physics III	3	2	5
Electric Power Generation and Dis- tribution	—	3	3
Mechanics of Materials	—	3	3
Mechanics of Machinery	—	2	2
Machine Design and Drawing	3	—	3
Electrical Engineering Laboratory	3	—	3
Mechanical Engineering Laboratory	3	—	3
English, one hour bi-weekly	—	—	—
Engineering Seminary, bi-weekly ..	—	—	—
	15	15	30

SENIOR YEAR

SUBJECT	Scheduled hours per week		
	Lab'y or Drawing	Rec't'n or Lecture	Total No. of Hours
FIRST TERM			
Electro-Magnets	—	3	3
Alternating Currents	—	3	3
Telephones and Telephone Sys- tems	—	2	2
Telegraphs and Signal Systems ..	—	2	2
Electro-Chemistry	—	2	2
Thermodynamics and the Steam- Engine	—	3	3
Electrical Drawing and Design	3	—	3
Electrical Engineering Laboratory ..	9	—	9
Mechanical Engineering Laboratory ..	3	—	3
Building Construction }	—	2	2
Business Methods }	—	—	—
English, one hour bi-weekly	—	—	—
Engineering Seminary, bi-weekly ..	—	—	—
Visits of Inspection, monthly	—	—	—
	15	15	30
SECOND TERM			
Dynamo Design }	—	4	4
Electrical Engineering }	—	3	3
Alternating Currents	—	2	2
Telegraphs and Signal Systems. }	—	—	—
Electrical Measuring Instruments }	—	4	4
Steam Machinery, Gas- and Oil- }	—	2	2
Engines, Mechanical Refriger- }	—	3	3
ation	3	—	3
Hydraulic Machinery	3	—	3
Electrical Design	9	—	9
Mechanical Engineering Laboratory ..	—	—	—
Electrical Engineering Laboratory ..	—	—	—
English, one hour bi-weekly	—	—	—
Engineering Seminary, bi-weekly ..	—	—	—
Visits of Inspection, monthly	—	—	—
	15	15	30

DIPLOMA

The Diploma of the Institute is granted to students who complete the full course and pass all the required examinations.

ADMISSION

(The requirements for admission are fully specified on page 57.)

FEES AND TERMS

The fee is the same for each year of the course.

First term of each year, *thirty-eight dollars*; second term, *thirty-seven dollars*.

A deposit is required of every student, at the beginning of each year, to insure the Institute against loss through injury to the apparatus in the laboratories. This is returned at the close of the year, less the cost of the apparatus injured or destroyed. For the Freshman year this deposit is five dollars; for the Junior and the Senior year, ten dollars. All the apparatus and materials used in the laboratories are supplied by the Institute.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

GENERAL EXPENSES

Students supply their own text-books and stationery. The cost, including a set of drawing instruments required in the first year of the work, amounts to about *twenty dollars* a year.

Board and lodging can be obtained near the Institute for *five dollars* per week, upwards.

LIBRARY AND READING-ROOM

The Library of the Institute, which contains thirty-one thousand volumes, is well supplied with works on the various subjects included in the course. Additions are constantly made of new books as they appear.

The Reading-room is supplied with the best home and foreign periodicals of art, science, technology, and literature, including the leading journals relating to electricity and allied subjects.

CLASSROOMS AND LABORATORIES

The classrooms and laboratories of the School of Engineering are located mainly in East Hall. The Engineering Laboratories are on the ground floor of the building; the classrooms and drawing-rooms occupy the first floor. The Physical and Chemical Laboratories and the shops are in the Main Building. In this way a thorough correlation of the different branches is assured and the work of the individual student can be readily supervised.

THE CLASSROOMS are provided with every comfort and convenience; the Science lecture-rooms are equipped with stereopticon lanterns, gas, electric, and water connections, and other appliances.

THE ENGINEERING DRAWING-ROOM is a large, well-lighted room, provided with desks, each of which has conveniently arranged drawers, under lock and key, for

drawing materials, drawing-board, and the various hand-books, prints, and data relating to such designing work as the student may have in hand. A fine collection of blue-prints, photographs and drawings, hand-books and catalogues, is available in connection with this department of work. All the calculating devices usually found in well-appointed commercial drawing-rooms are also provided.

THE HEADQUARTERS ROOM of the School is arranged as a reading-room, and is supplied with the leading technical periodicals for ready reference by the students.

THE PHYSICAL LABORATORY is on the second floor of the Main Building, directly over the front entrance. The Main Laboratory is a large, well-lighted room (40 x 40 ft.) well equipped with work-tables, gas and electrical connections, lockers for ninety-six students, apparatus cases and cabinets, standard clock, and various pieces of apparatus permanently mounted on the walls. Adjoining the Main Laboratory are four smaller rooms, about 13 x 25 ft. each. The two east rooms are the apparatus- and supply-room and the office. The two west rooms can be darkened for light experiments when desired. The front one contains a fully equipped motor-driven lathe, cases of metal- and wood-working tools, stock of materials, etc.; also a set of weather-bureau apparatus, including instruments for autographic records of barometric pressure, wind velocity and direction, rainfall, and sunshine; high-grade Fortin and aneroid barometers, a standard anemometer, various forms of hygrometers, maximum and minimum thermometers, etc.

Some of the more expensive pieces of apparatus for experiments in light are: A Genève Société Optical Bench, with a complete set of attachments and accessories; apparatus for projection of polarization and double refraction phenomena, also for microscopic projection; a good Reichert microscope with a large set of slides; comparator microscopes with micrometer attachments; mounted telescopes; several forms of spectroscopes, spectrometers, and polariscopes; several sets of lenses for various purposes, some sets achromatic; special prisms; diffraction gratings; a large variety of vacuum tubes; a large induction coil; and many less expensive but very useful pieces of apparatus in the same line.

There is also a good equipment of lecture-room and laboratory apparatus for experiments in mechanics of solids and fluids, heat and sound; for example, among the apparatus for measurements of length are a dividing-engine, a cathetometer, and a comparator with a standard metre-bar.

THE CHEMICAL LABORATORIES are large, well-appointed, and well-ventilated rooms.

The General Laboratory has desks to accommodate one hundred and seventy students. The desks have soapstone tops and drain to sinks, arranged so that four students are grouped around each one. Each student has his own reagent bottles, arranged in such a way that the supply of light is not interfered with. The fume closets or hoods are perfectly arranged, so that noxious vapors and acid fumes are carried off by an artificial draft.

Opening from this laboratory on one side is the department office and private laboratory, and on the other the store-room stocked with a large quantity of chemicals, glass and porcelain ware, and general supplies, which are issued to the students as required. All apparatus and supplies are imported from Germany and are of strictly first-class quality.

The Quantitative Laboratory (used for technical and organic chemistry) has accommodations for sixty students. The desks are provided with gas and water connections and waste-pipes, placed so as to be conveniently reached. Three large hoods are provided to carry off noxious fumes. Adjoining this laboratory is the balance-room, containing five Becker balances and an assay balance for weighing beads of gold and silver. A separate store-room for this laboratory is provided to meet its especial needs. Distilled water is furnished by three Jewell stills in the laboratories.

Among the special forms of apparatus in use in the laboratories are: the Hempel, Winkler, Orsat, Elliott, and Thomas apparatus for gas analysis; a Redwood viscosimeter and Pennsylvania R. R. viscosimeter pipette for use in oil testing; a Thompson and Barrus calorimeter for work in fuel calorimetry.

THE ELECTRICAL ENGINEERING LABORATORIES are all on the ground floor of the Institute buildings. They contain a complete equipment of modern electrical machinery and testing apparatus. The Dynamo Laboratories are in the Main Building, adjoining the boiler-room and the extensive electrical lighting plant of the Institute, from which they are, however, entirely

separated. Opening from the Dynamo Laboratory on one side is the Storage Battery Room, and on the other side is a passage leading to the Galvanometer and Photometer Laboratories.

A comprehensive system of switchboards and trunk lines makes it possible to supply direct or alternating dynamo current, or battery current, from different centres to any part of any of the laboratories.

The Dynamo Laboratory has its motive power supplied by a Porter-Allen seventy-five horse-power engine which drives a counter-shaft. Dynamos representing all the important types in use are driven from this shaft. There is a thirty K. W. 500-volt compound dynamo available for this or any lower E. M. F.; a T. H. arc-dynamo; a 250-ampere 10-volt dynamo; several 110-volt dynamos. There are motors adapted to all the circuits which would be supplied from the different kinds of dynamos, including a pair of street-car motors arranged so that complete tests of them may be made. All the machines are of such size that commercial conditions are met by the student, without his encountering great difficulty in making up circuits or handling large currents through temporary connections. All necessary instruments for making measurements of dynamo current are found here. There are ammeters and voltmeters in great variety of range; speed-counters and stop-watches; rheostats and lamp-banks, etc. The arc-dynamo is connected with its own switch-board, and current is distributed through this to arc-lamps of various types. The arc-lamps in the laboratory represent the most recent forms and makes. Cur-

rent at 110 volts is derived as desired from the lighting plant of the Institute, but no current is sent to it from the laboratory. A 15 K. W. 110-volt dynamo direct-connected to a double-vertical Armington & Sims high-speed engine gives an example of this type of machine.

The Alternating Current Laboratory contains a good equipment of representative apparatus. There are single and polyphase dynamos; dynamos for high and low frequency; induction and synchronous motors; a 10 K. W. rotary converter. At the Alternating Current switchboard is a specially devised panel by means of which two- or three-phase current at 110 or 220 volts, as desired, is available from the same dynamo. There are many types and sizes of alternating current transformers and apparatus to illustrate special systems of arc and incandescent lighting. A motor drive is provided for the alternating current dynamos, so that their frequency may be more closely controlled. All instruments and apparatus required to make complete tests of these machines, as well as to perform many laboratory exercises, are part of the equipment.

The Storage Battery Laboratory contains sixty cells, showing the recent products of different makers. These are connected with a special switchboard, so that they can be used in any desired combinations. This laboratory is planned for various electro-chemical and electro-deposition work. In it are kept also various water- and water-cooled rheostats, since a continuous flow of water can there be maintained and a large amount of power be absorbed without inconvenience.

The Galvanometer Laboratories are arranged in a

number of small rooms, in each of which two men only work at one time. Certain rooms are assigned for special purposes; for example, one for high-voltage tests of insulating materials; one for exact measurement of resistance; one for tests of magnetic permeability and general ballistic galvanometer work; one for standardizing ammeters, voltmeters, and wattmeters. The instrument room in the Galvanometer Laboratories is available for general electrical work, for such chemical work as may be desired, and as a centre from which primary battery current is distributed. In the various rooms are placed galvanometers, wheatstone bridges, condensers, standards of electromotive-force, of resistance, of inductance, voltmeters, and many delicate and expensive appliances for accurate measurements. Located as the rooms of this laboratory are, all effects due to the proximity of large magnetic masses of iron and to the vibration of the building or of machinery in motion are obviated.

Some special apparatus is installed for laboratory work, in connection with the class work given in Telegraphy and Telephony. This is of the most recent make, and in Telephony it represents subscriber's and central office equipment for magneto, multiple, and common battery systems.

The Photometer Laboratory is arranged for the measurement of the candle-power of all the various modern types of electric lights, as well as for those using oil or gas. Most of the apparatus has been specially designed for this laboratory. It contains the best types of light standards known to modern science, and in it

are used the best forms of cars and sight-boxes for light determinations. An illumination photometer has recently been added to this equipment.

THE MECHANICAL ENGINEERING LABORATORIES are situated also on the ground-floor of the Institute buildings. The rooms are large, well-lighted, of ready access from the class-rooms and drawing-rooms, and each is devoted to a special division of the work.

The Steam Laboratory contains a fifty horse-power Wetherill-Corliss engine connected to a seventy-five horse-power Wheeler surface condenser and air-pump, and provided with Prony brake and all appliances for general work in indicator practice and engine-testing; a ten horse-power vertical throttling engine for first experiments in engine-running, valve-settings, clearance determinations, etc.; a seventy-five horse-power Porter-Allen engine, belted to a line shaft in the Electrical Laboratory, thus readily providing it with dynamo loads; a twenty-five horse-power Armington & Sims double-vertical, direct-connected high-speed engine of the marine type; and a sixty horse-power Westinghouse compound engine. In addition to these a two hundred and fifty horse-power Ames automatic cut-off, a Harrisburg "Ideal" of fifty horse-power, and a Ball engine of ninety horse-power, in the Institute lighting plant, are available for a variety of experimental work. A battery of boilers provides means for making boiler tests and related experiments on an extended scale.

There are also a gas-engine of ten horse-power equipped for complete tests; several types of injectors;

a De Laval steam-turbine of ten horse-power, provided with separate sets of nozzles for condensing and non-condensing conditions; several types of steam-separators, steam-traps, automatic pressure-reducing and other special valves, illustrated both by examples in use and by sectioned models. Besides these, are the feed-water heaters, feed-pumps, and other auxiliaries about the power-plant, all of which are available for the purposes of laboratory investigation.

Among the engineering measuring instruments may be mentioned: Steam calorimeters—separating, throttling, and barrel; ten steam- and gas-engine indicators of different makes; tachometers and speed-counters; numerous steam- and water-pressure gauges of wide range; mercury and water manometers; a Green meteorological mercurial barometer; apparatus for the hot calibration of indicator springs; a Crosby gauge-testing outfit; planimeters of different types with calibration plates; a general assortment of steam thermometers ranging from 1000° F. down; platform scales of various capacities; besides other appliances.

The laboratory possesses also a complete equipment for the analysis of flue gases and the determination of the heating values of fuels, including an Ashcroft flue-gas pyrometer; a Chatalier thermo-electric pyrometer; the Fisher-Orsat and the Hempel forms of apparatus for gas analysis; apparatus for the proximate analysis of fuels; and an accurate fuel calorimeter.

The Laboratory for the Testing of Materials is equipped with an Olsen testing-machine of 200,000 pounds capacity, arranged for tensile, compressive,

shearing, and transverse testing. It is provided with lateral and vertical extensions for the special testing of beams up to spans of twenty feet, and of columns up to a length of ten feet; a 60,000 inch-pound torsion testing-machine for shafting; a Thurston oil testing-machine with hydrometers, viscosimeters, and flash-point apparatus, for the testing of lubricating oils; a 2000-pound capacity Olsen cement testing-machine. Among other instruments may be mentioned: a Henning extensometer, attachments for autographic stress-strain diagrams, and deflectometers for beams and columns.

The Hydraulic and Pneumatic Laboratory is provided with a Worthington duplex steam-pump; impact water-wheel; centrifugal pump; hydraulic ram; accumulators; tanks, water-meters, Pitots tube, hook-gauges, and other measuring apparatus; an air-compressor; manometers; pneumatic tools, and other appliances.

THE INSTITUTE SHOPS

These shops are all located in the basement of the Main Building in close proximity to each other and to the Engineering Laboratories. They are spacious, comfortable rooms. The machinery installed in them is driven by electric motors, so that it may be independently operated and controlled.

The Woodworking and Pattern Shop contains eighteen hundred square feet of floor surface and is equipped with twenty-eight individual benches, each supplied with a full set of first-class tools. There are wood-turning lathes swinging twelve inches, face-plate lathes

swinging ten inches, one face-plate lathe swinging seven feet, a band-saw, a jig-saw, a scroll-saw, a circular saw, a moulding machine, a six-inch sensitive drill press.

The Forge Shop contains seventeen forges, including one large forge for extra heavy work. All the forges are supplied with power blast and forced exhaust, operating on the down-draft system. A drill press and grinding machinery are included among the machines installed. The equipment of hand tools includes all the forms usual in general work.

A room adjoining the Forge Shop is set aside for foundry work, and is intended to give students an insight into methods of work. It is equipped with a number of troughs for bench-moulding work and for core-making. A brass pit in which alloys can be melted in crucibles is provided, so that the principles of moulding and casting can be learned without the danger encountered when handling large amounts of melted iron. A case-hardening oven is included also in this equipment.

The Machine Shop has a good equipment of modern machine tools, as follows: Eleven engine lathes ranging from six-inch to twenty-one-inch swing, including types representative of the best makers; three shapers (10 and 12 inch), one six-inch slotting machine; one thirty-six-inch vertical drill press; four six-inch sensitive drill presses; one twenty-six-inch planer; one Brown & Sharpe No. 3 universal milling machine; one Brown & Sharpe universal grinding machine; one Brown & Sharpe cutter and reamer grinder; one twist drill grinding machine; two emery tool-grinders.

There are thirty-three vise benches, equipped with all the regular tools for chipping, filing, and fitting work; and a complete tool-room equipment of reamers, gauges, surface-plates, micrometers, and small tools of all kinds.

SUBJECTS OF INSTRUCTION

MATHEMATICS

The mathematics of the Preparatory year includes the following subjects: Algebra—logarithms, ratio and proportion; variation; the progressions; plotting of equations; permutations; binomial theorem; theorem of indeterminate coefficients. Plane Trigonometry—trigonometrical identities and equations; solution of right and oblique triangles, with practical application to problems in heights, distances, and areas. Solid Geometry—complete, with the exception of conic sections. Theoretical Mechanics—treating of statics and dynamics. An elementary course in land surveying, direct leveling, topographical surveying, map drawing, preliminary railroad surveying, is offered as optional. Students who can find the time are advised to take the elementary course.

JUNIOR YEAR.—The students begin at once the study of calculus. The essentials of analytical geometry are given in connection with the first term's work, many of the formulæ being derived by the aid of the calculus. The differential and the integral calculus are carried along together, thus affording early application to a large class of practical problems. The student is thereby enabled to make early use of his mathematics as a valuable instrument in his engineering work.

MECHANICAL DRAWING

At the beginning of the course the student draws simple objects in the three planes of projection. He works by the aid of objects and is thus taught at once to use his imagination, to see the real thing from the line drawing—to read a drawing. At the same time, he learns how to draw objects to different "scales." While following these exercises he is learning to use his drawing instruments, no special exercises to this end being set.

After the above-named exercises are completed, a systematic but brief course in intersections and developments is given. Then come freehand sketches and working drawings made from machine parts. In connection with this last division of the subject, special attention is given to form and style in drawing. Shop methods and conventions are introduced as frequently as possible. Each student is required to make tracings and blue-prints from certain machine drawings. Some exercise work in isometric drawing completes the course.

Parallel with the course in Mechanical Drawing and running through the year is that in lettering, on which special emphasis is placed. Attention is given to those styles of figures and letters which every draughtsman is required to use in commercial draughting.

PHYSICS

The work in Physics is continued through two years. The first year's work includes two recitations per week, one three-hour laboratory period, and one illustrated lecture per week. The recitations and laboratory work are continued through the second year.

The first year's work, Course II, is devoted to the elements of Mechanics, Heat, Magnetism, and Electricity, the most difficult parts of which are omitted. The topics treated are chosen with reference to their technical importance and their bearing on subsequent engineering work. The purpose is to familiarize the student with the principal facts, definitions, laws, and relations of quantities, to teach him how to apply these facts in the solution of problems; and to acquaint him with the method of obtaining from definitions or experimental data, the relations of quantities that are necessary for the solution of practical problems. The ability to apply in practice what is learned is made the principal test of a satisfactory knowledge of the subjects studied.

The second year's work, Course III, includes a more advanced and thorough study of Mechanics, Heat, Sound, and Light.

The laboratory and the classroom work run nearly parallel and supplement each other. In the laboratory the student has opportunity to apply much that he learns in class; to study the methods essential for successful experimentation, and to learn to express the result of experiments by plotted curves, tabulation, or diagrams; he is taught also to interpret and draw conclusions from the results so represented. The sources of error are sought and the means or methods by which the errors may be eliminated, or made so small

that they may be neglected, are studied. The accuracy desirable or attainable in the experiments is considered and the degree to which the computed result may be relied upon is expressed.

An effort is made to cultivate self-reliance and independence in thinking and reasoning, also ability to overcome difficulties or devise means of removing them.

The work is quantitative in character and is intended to give a good foundation for subsequent experimentation or research. As the work progresses the student becomes familiar with the uses and manipulation of the more delicate and precise instruments of measurement with which the laboratory is well equipped.

CHEMISTRY

GENERAL CHEMISTRY.—A course of lectures and laboratory work extending through one year, with oral and written examinations.

The lectures are fully illustrated by experiments, charts and diagrams, specimens, and lantern views.

The instruction is made thorough and practical by constant personal supervision in the laboratories.

The student is trained to obtain by induction the more important principles of the science, to study the comparative properties of substances, and particularly to acquire a scientific habit of thought. Many problems are introduced throughout the course.

Notes are taken by the students at the lectures and in the laboratory, and complete records of their laboratory work, including descriptions and sketches, are kept in books which are examined weekly.

QUALITATIVE ANALYSIS.—The study of the reaction of the commoner metals is followed by the analysis of solutions containing them; of solutions containing bases and acids; and finally of powders, insoluble substances, alloys, and materials used in various branches of engineering work.

TECHNICAL CHEMISTRY.—The following investigations are made:

Fuel.—Proximate analysis of coal; moisture, volatile matter, coke, ash, and sulphur. Specific gravity and calorific value.

Gas.—Determinations of carbon dioxide, carbon monoxide, hydrogen, and nitrogen. The Elliott, Fisher-Orsat, and Hempel forms of apparatus are used.

Water.—Total solid matter, temporary and permanent hardness, chlorides, sulphates, nitrates; also silica, iron oxide, alumina, lime, magnesia, potash, and soda.

Lubricating Oil.—Specific gravity; viscosity; cold test; flashing point; loss in weight on exposure to elevated temperature; tendency to oxidize and gum, percentage of mineral and of fatty oil, free fatty acid, free mineral acid, suspended matter, rosin oil.

APPLIED ELECTRO-CHEMISTRY.—The scope of this work is indicated by the following list of topics studied:

General Theory—refining of metals by electrolysis of aqueous solutions or of fused electrolytes. Production of alkali, chlorine, organic compounds, and many chemicals. Chemical products of the electric furnace; electro-deposition.

ENGINEERING SUBJECTS

ELECTRICITY—GENERAL THEORY.—An advanced course dealing with the principles of electrostatics, magnetism, and current electricity. A previous knowledge of Physics II is required before undertaking this course. Practical application of the principles studied in commercial engineering apparatus are comprehensively discussed. All the work is quantitative and is accompanied by numerous numerical problems.

ELECTRIC POWER GENERATION AND DISTRIBUTION.—Direct-current dynamo types; characteristics; elementary features of windings and construction. Constant potential machines; constant current machines. Incandescent and arc lamps, with reference to typical forms and accepted methods of operating them. Direct-current motor—types, performance, commercial applications. Direct current systems of distribution—constant potential, three-wire, constant current. Line wires and wiring; the calculation of proper sizes. Switchboards. Dynamo connections for combined output.

ELECTRO-MAGNETS.—The principles and units of the magnetic circuit. Applications of these in magnets designed for pulling, lifting, and signaling work. Magnetic leakage. Specific magnet designs for specified duty.

DYNAMO DESIGN.—General theory of direct current dynamos and motors, with special reference to the effect of altered design on the result obtained. Armature windings and armature construction. Commutators, brushes, and theory of commutation. A complete dynamo or motor design. Special design features in arc dynamos, plating dynamos, boosters, dynamotors.

ALTERNATING CURRENTS.—The theory of periodic currents. Inductance and its effects in an alternating current circuit. Capacity and the effects produced by it. Methods of solving problems of the alternating current circuit. Methods of making experimental measurements. The alternating current dynamo; its armature winding, its excitation, its characteristics, its efficiency. Methods of operating into distributing circuits. Mutual inductance and transformer theory. Polyphase alternators, motors, and distributing systems. Polyphase motor theory and practice. The designing of distributing systems. The planning of transformers, alternators, and alternating current motors.

TELEPHONES AND TELEPHONE SYSTEMS.—The history and theory of the development of transmitters and receivers. Calling apparatus, hook-switches, induction coils. Central station systems which are much in use, with especial emphasis on common battery systems and the switchboard devices employed. Intercommunicating systems. Cables and lines.

TELEGRAPH AND SIGNAL SYSTEMS.—All the common systems are studied, including the Morse, duplex, quadruplex, submarine, automatic, Marconi, district messenger, and fire-alarm telegraphs, in addition to railway block signal systems.

Each system is taken up in detail. The apparatus used in each and the adjustments made in operating it are studied. The adaptability of the systems and their limitations are separately considered.

ELECTRICAL MEASURING INSTRUMENTS.—Methods of construction, use, adjustment, calibration, and repair of all kinds of galvanometers, shunts, resistances, condensers, ammeters, voltmeters, wattmeters, power-factor indicators, etc.

The application of these instruments to the testing of dynamo machinery; of distributing circuits for telegraph, telephone, light, and power service; and of the various materials used in engineering work.

ELECTRICAL ENGINEERING.—Cost of transmission and distribution of energy. Depreciation of electrical apparatus. Complete systems of distribution for lighting and for railway service. Traction problems. Storage battery engineering. Lighting problems, including use of different methods, different arrangements, and the like. Estimates. Specifications.

ELECTRICAL DRAWING AND DESIGN.—This course consists of drawing-room work in making electrical diagrams, planned to teach the usual methods and conventions; exercises in simplifying complicated diagrams and in preparing simple diagrams to satisfy special conditions. Designs of house-wiring are worked out later, including switches, panel-boards, etc. Each student designs a rheostat for specific duty, a magnet, or a switchboard. The class makes a design for a dynamo or a motor and complete working drawings of it, also a piece of alternating current apparatus. This work is planned to come at times when the class work is most nearly related to it. It is found to have its highest value when given in this way.

ELECTRICAL ENGINEERING LABORATORY.—This work is carried through both years of the course. The work is at first elementary in character, with a view to initiating the student into the methods of connecting circuits, the making of measurements, and the use of common apparatus and instruments. As the work advances, students make more comprehensive and important tests and operate more valuable machinery and apparatus. Throughout the course the laboratory work is arranged, so far as possible, with a view to familiarize students with commercial methods and machines. The making of tests which have no practical bearing are omitted. When research work is undertaken it is only such as has an intimate relation to current engineering practice.

The principal lines of experimental work are, as follows: the use of all kinds of instruments which are found in a commercial laboratory and their calibration; measurements of current, electromotive force, resistance, capacity; battery tests; insulation resistance measurements; conductivity and permeability determinations; accurate adjustment of resistance coils; silver and copper electrolysis for exact current measurement. Photometry of arc and incandescent lights; their efficiency; determinations of the value of light standards and candle-power of secondary standards.

Connecting, operating, and making tests upon the various types of direct-current dynamos and motors, to determine efficiency and capacity; setting brushes; winding armatures; finding trouble; repairing rheostats; wiring arc-lamps; operating dynamos in parallel.

Measurements in alternating current circuits, both single and polyphase, of power transformed, of inductance, of capacity. Transformer tests for regulation and efficiency. Connecting various kinds of distributing circuits and operating them. Alternator testing; synchronous and induction motor testing; rotary converter testing.

Students are required to make themselves familiar with the commercial operation of a central station plant, by taking part in running it from time to time. The extensive lighting plant of the Institute is made use of for the purpose.

MECHANICS OF MATERIALS.—The investigation of tensile, compressive, and shearing stresses in rods, beams, columns, and shafts; factors of safety; investigation and design of riveted joints; maximum allowable deflections in beams, columns, and shafts; continuous and restrained beams; stresses in shafts subject to both torsional and deflective forces, eccentric loading of columns, and other examples of combined stresses; numerous applications to problems in the designing of machine parts and members of structures.

PRINCIPLES OF MECHANISM.—The discussion of the principal forms of constrained motion; types of gearing, wheel-trains, and the essential form of wheel-teeth; parallel motions, universal joint, and other linkages; communication of motion by cams, pulleys, belts, and ropes. Graphical problems in the designing of mechanisms.

MECHANICS OF MACHINERY.—The application of the fundamental principles of mechanics to the special consideration of the forces and motions occurring in machines; graphical analysis of stresses; diagrams of velocity and acceleration; stresses due to inertia; friction, power, and work; problems in the transmission of force and energy; calculation of stresses in machine members; numerous applications to problems in machine design. This course accompanies the course in Machine Design and Drawing and serves to extend its range.

MATERIALS OF ENGINEERING.—A brief course descriptive of the physical and chemical properties of the more common materials

used in engineering work, to the end that the designer may be enabled to select the most suitable material for the individual members of a machine or structure. It consists of an outline of the metallurgy of iron and steel; the effect of slight variation in chemical composition upon the physical properties of the materials; the effect of mechanical treatment; the effect of heat treatment on the structure of steel-hardening, tempering, annealing; tool steels and cutting speeds; alloys of copper, zinc, and tin; bearing metals; character of stresses, factors of safety, and other considerations affecting the selection of material.

MACHINE DESIGN AND DRAWING.—This course aims to afford practice in the actual designing of machinery. It begins with the application of the Principles of Mechanism and the Mechanics of Machinery to machine elements and power transmission devices and brings in such other considerations as are essential to good design. The designing of simple machines is then taken up, afterward the designing of larger and more complex machines. The course includes also designs, in whole or in part, of hoisting and conveying machinery, steam machinery—boiler, engine, and auxiliaries—and power-plant installation. The larger problems are taken up by the class as a whole and the general design outlined, after which the remaining work is apportioned among the individual members, each student keeping in touch with the progress of the others.

The machine design work is done mainly over the drawing-board and is carried on as nearly as possible as in a regular engineering drawing-office. Special attention is given to the cultivation of habits of accuracy, completeness, and neatness in the making of working drawings, which are further required to be executed in accordance with the conventions and requirements of the best practice. Diagrams, tabulated data, trade catalogues, blue-prints, and engineering reference books are freely used.

STEAM-BOILERS.—A descriptive study of the various types and makes of steam-generators in common use and the adaptability of each type to special work or localities; the constituents of fuels and the intensity and quantity of heat evolved by their combustion; natural and forced draft; corrosion, incrustation, and other deteriorating influences and the means adopted for lessening them; settings, furnaces, and chimneys; the position of feed-inlet, blow-out valve and pipes, pressure-gauges, safety-valves, gauge-cocks, and other fittings, and the manner of attaching them to the boiler; legal

requirements and boiler inspection; determination of grate surface, heating surface, and the relative efficiency of different portions of the latter in the evaporation of water; strength of boilers; staying and other details of construction; accessories; boiler-testing and boiler design. The study is accompanied by the actual testing of boilers in the Mechanical Engineering Laboratory and by the designing of a steam-boiler.

MECHANICAL ENGINEERING LABORATORY WORK.—The work done in the laboratories is primarily intended to accompany and make practical application of the principles taught in the classroom and the lecture-room. The practical side of steam engineering is emphasized and, so far as possible, the duties of the stationary engineer are exemplified. The student is afforded also an opportunity to do some original work having direct bearing upon current engineering practice. Besides, the student is made familiar with the use and adjustment of the principal engineering measuring instruments, and incidentally is brought in close touch with a great variety of commercial appliances.

The following experiments, required of each student, will give some idea of the scope and character of the work: Calibration of the principal measuring instruments; practice in the use of the principal makes of steam-engine indicators on a variety of engines, under different conditions, and with various kinds of reducing motions; interpretation of steam-engine, gas-engine, and pump-indicator diagrams with reference to valve adjustments; setting the slide-valve and the Corliss valve by measurement and by indicator diagram; measurements of moisture in steam; computation from the diagram of weight of steam used in the engine clearance, cylinder condensation, and reevaporation; tests of the steam-injector; flue-gas analysis, and determination of heat lost in the waste gases; determination of the available heat in a fuel and the amount of moisture present; engine tests with Prony brake, or dynamo load, and surface-condenser to determine steam consumption, thermal efficiency, mechanical efficiency; tests of compound engines, and construction of combined indicator diagrams; computation of heat losses by Hirn's method; boiler trials and plant efficiencies.

Tests are made in the Strength of Materials Laboratory of the behavior of the principal materials of engineering when under stress. These include the determination, by experiment, of ultimate resist-

ance, elastic limit, and ductility of the principal metals and woods in tension, compression, and shear; the strength of cements in tension and compression; the transverse strength and deflection of wooden beams and the common iron or steel structural shapes; the torsional strength and deflection of shafting; the strength of columns. These experiments are made while the class is engaged in the study of the Mechanics of Materials, and greatly assist in making that instruction thorough and concrete. Lubricants are tested for coefficient of friction, and for durability. Efficiency tests are made of steam-pump, gas-engine, hydraulic ram, centrifugal pump, water-turbines, and steam-turbines. Tests of the strength and slippage of belts and of the power required by machine tools are also made. The course is concluded by a complete trial of a large power-plant or lighting station according to the revised codes of the American Society of Mechanical Engineers.

THERMODYNAMICS AND THE STEAM-ENGINE.—The general principles of thermodynamics are taken up as an introduction to the more special study of the subjects of steam-engine, gas- and oil-engines, air-compressors, and mechanical refrigeration which follow. They include the consideration of work; specific heat of a gas and vapor; latent heat; the application of Boyle's law to the determination of the available work in a given quantity of a gas; isothermal and adiabatic expansion lines; the mechanical equivalent of heat; comparison of the work actually obtained in a heat engine with that of an ideal engine working in Carnot's cycle.

The special study of the Steam-Engine immediately follows that of Thermodynamics and begins with the consideration of the peculiar properties of steam as an agent for the conversion of heat into mechanical energy. It includes initial condensation and the quality of the steam in the cylinder; indicator diagrams; economies effected by condensing, compounding, superheating, and by the steam-jacket; jet- and surface-condensers; feed-water heaters; the injector; air and circulating pumps; the dynamics of the steam-engine; the mechanical and the thermal efficiency of the steam-engine and engine-testing; the various types of engines; engine details; engine foundations and bed-plates; piping and attachments.

STEAM MACHINERY, GAS- AND OIL-ENGINES, AND MECHANICAL REFRIGERATION.—Steam Machinery includes steam-pumps, steam-turbines, hoisting engines, and the steam auxiliaries about a power

plant. Gas- and Oil-Engines includes: the special thermodynamics of these engines; description of the various types in use; combustion and explosion; ignition devices; gas-engines giving an impulse at every revolution; Otto-cycle engines; gas- and oil-engine governors; mechanical details. Mechanical Refrigeration—the various systems, processes, and applications.

HYDRAULIC AND PNEUMATIC MACHINERY.—The flow of water in pipes, through orifices, and over weirs. Work available from a given quantity and head of water; water-wheels; the different types of turbines with special reference to those used in dynamo driving; reaction and impulse wheels; centrifugal pumps and water-pressure engines; hydraulic presses; elevators and accumulators; method of regulating the flow through reaction wheels and loss in efficiency resulting from partial flow; hydraulic governors and their comparative value in connection with turbines driving electrical machinery.

The physical properties of air; flow under pressure through orifices; force due to motion. The thermodynamics of air machinery. The air-compressor; compressed air transmission devices; compressed air motor; rock-drills and compressed air mining machinery; pneumatic tools and appliances; the pneumatic system of tube transmission. The properties of liquid air and its uses.

SHOPWORK.—The Shopwork is planned to bring the student into practical contact with machinery and materials of construction, in order that he may acquire a working knowledge of their properties and learn the methods used to prepare them for their place in finished machines. The exercises are chosen with a view to teach him to make satisfactory drawings and designs and to understand the uses of materials. All work is done from regular shop blue-prints which the student must read and understand.

The Woodworking exercises include: Use of lathes and lathe tools, simple pattern-making, illustrating the use of draft, centre lines, shrink, rule, and moulding; pattern-work to show constructions to avoid warping and twisting; other exercises to show the use of core prints and core boxes; still other patterns requiring the use of three-part moulds; and an engine cylinder including core boxes. All work is done from the regular machine drawings.

FOUNDRY WORK.—An elementary course of instruction is given in the preparing of sand, placing flasks and patterns, removing patterns from the flask, facing, ramming, and parting. Students

are shown how to place spues, gates, vents, risers, and do pairing. They work with one- or two-part moulds. In core-making they deal with binders, mixtures, baking, pasting, and blacking. In casting, mixtures for bronze, brass, and white metal are made.

FORGE WORK.—The Forge Shop exercises include bending iron, drawing out, upsetting, tapering, chamfering, twisting, punching. In making the exercises the student learns the uses of the hammer, chisels, hardy, sledge, punches, swedges, fullers. Welding, hardening, tempering, annealing, machine-tool forging, tool-making, and ornamental ironwork. Along with this work the student becomes familiar with the forge, the anvil and the tools, and learns how to manage a fire properly.

MACHINE WORK.—In the Machine Shop the student spends part of his time on vise work, clipping, filing, and fitting. Some exercises in soft and hard soldering and in brazing accompany the vise work. The remainder of his time is spent on machine tools. He is at first given exercises to bring out the principal features of the machines, and he is taught how to handle these in order to produce desired results; he then learns the proper speeds, feeds, and tools to employ. Afterward he works to drawing, planning, shaping, slotting, drilling, turning, milling, thread-cutting, gear-cutting, as the machine part he is working on may require. Each man gives special consideration to the availability of any machine to a particular process in hand.

ENGLISH LANGUAGE

The purpose of this work is to cultivate in the engineering students the ability to write good English. To this end all written work is not only criticised for technical correctness, but is separately criticised and marked for English expression.

The proper forms in writing a report or in framing a specification are presented and exercises in such work are set. The students are familiarized also with good English as it is found in technical literature.

BUSINESS METHODS

The scope and purpose of this course are indicated by the schedule of topics. These are considered in detail:

Bank checks; promissory notes; partnerships; stock companies; investment securities; insurance; commercial credit; failure and assignments; contracts; principal and agent; patents.

BUILDING CONSTRUCTION

The various common forms of construction, such as frame, brick, mill, slow-burning, steel and reinforced concrete, are studied. These are dealt with in such a way that students acquire a general knowledge of their structural features, the adaptability of each, and the common methods of disposing of pipes, wires, shafting, and other engineering appliances. The properties of stone, brick, concrete, as made use of in foundations for buildings and machinery, and the various lime and cement mortars, are also studied.

EVENING CLASSES

From the beginning of October until the end of March the following evening courses in Engineering Subjects are offered:

ELECTRICAL ENGINEERING

APPLIED ELECTRICITY.

ENGINEERING ELECTRICITY.

TELEPHONY.

DYNAMO DESIGN.

ALTERNATING CURRENT ENGINEERING.

ELECTRIC LIGHT ENGINEERING.

MECHANICAL ENGINEERING

STRENGTH OF MATERIALS AND APPLIED MECHANICS.

STEAM-ENGINE AND BOILERS.

DESIGN OF MACHINE ELEMENTS AND POWER TRANS-
MISSION DEVICES.

ADVANCED MACHINE DESIGN.

Full information concerning the Evening Courses in
Engineering Subjects will be found on page 240.

SCHOOL OF MECHANIC ARTS

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

LIEUTENANT WILLIAM L. BAILIE (Engineer Corps, U. S. Navy),
Director, and Instructor in the Theory and Practice
of the Steam-Engine.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

HOMER J. HOTCHKISS, A. M., M. M. E.,
Professor of Physics.

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

THOMAS SMITH, B. S., M. E.,
Professor of Mechanical Drawing.

ARTHUR J. ROWLAND,
Professor of Electrical Engineering.

H. L. MASON,
Professor of English Language and Literature.

ABRAHAM HENWOOD, B. S.,
Assistant Professor of Chemistry.

JOHN T. HOLDSWORTH,
Professor of Political Science.

HOWARD H. DENN,
Instructor in Mechanical Drawing.

HAROLD W. WALLS,
Instructor in Mechanical Drawing.

FLOYD K. RICHTMYER, A. B.,
Instructor in Physics.

KATHARINE D. BROWN, B. S.,
Instructor in Mathematics.

A. E. CHASE, B. A.,
Instructor in History.

- M. G. ALLEN,
Instructor in Mathematics.
- L. M. DALTON,
Instructor in English.
- J. PETERSON RYDER, S. B.,
Director of Physical Training.
- EMIL LORCH, A. M.,
Lecturer on Architectural Styles.
- CLEMENT E. MOSSOP,
Instructor in Bench-Work and Machine-Work.
- R. WILLETTE CLINGER,
Instructor in Woodwork.
- THOMAS MCCREIGHT,
Instructor in Forging.

The School of Mechanic Arts provides a thorough course of instruction and training in mathematics, science, drawing, and shop-work, in connection with the essential English branches of a secondary education.

While the education given is intended to prepare for business or industrial pursuits, it seeks to develop and cultivate those qualities of mind and character that are of most value in the conduct of life. The object at every stage is to give the student the power to think and act for himself—the practical ability that is the best result of school training.

The whole course of instruction is so broad and yet so practical that the graduate is helped to determine the kind of work for which his taste and aptitude fit him; and at the same time he is prepared for such an advanced scientific or technical course as he may desire to pursue.

The School of Mechanic Arts prepares students for

admission to the technical courses in Electrical Engineering and Machine Construction in the Institute.

COURSE OF INSTRUCTION

JUNIOR YEAR

FIRST TERM

LANGUAGE.—Common figures of speech, punctuation, letter-writing. Reading of American classics.

MATHEMATICS.—Review of Arithmetic; the metric system of weights and measures. Algebra: to simple fractions, including the solution of some simple equations of the first degree.

DRAWING.—Mechanical, free-hand.

GENERAL HISTORY.—History of the civilization of Eastern nations. Greek history.

SHOP-WORK.—Woodwork: joinery. Ironwork: chipping and filing.

SECOND TERM

LANGUAGE.—Composition. Biographical studies of American classics.

MATHEMATICS.—Algebra: continued to theory of exponents. Plane Geometry: the straight line.

DRAWING.—Mechanical, free-hand.

GENERAL HISTORY.—Roman and medieval history.

SHOP-WORK.—Woodwork: joinery. Ironwork: chipping and filing.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

MIDDLE YEAR

FIRST TERM

LANGUAGE.—Sentences, diction, composition. Selected plays of Shakespeare.

SCHOOL OF MECHANIC ARTS

MATHEMATICS.—Algebra: theory of exponents, radicals, quadratic equations, imaginaries. Plane Geometry: the circle, similar figures.

DRAWING.—Mechanical, free-hand. Descriptive Geometry.

SCIENCE.—General Chemistry—lectures, recitations, and laboratory work.

GENERAL HISTORY.—Modern European history.

SHOP-WORK.—Woodwork: turning. Pattern-making begun. Ironwork: forging begun.

SECOND TERM

LANGUAGE.—Grammatical principles, composition. English classics.

MATHEMATICS.—Plane Geometry completed. Solid Geometry. Algebra: proportion, variation, progression, use of logarithms, plotting of functions.

DRAWING.—Mechanical, free-hand. Descriptive Geometry.

SCIENCE.—General Chemistry—lectures, recitations, and laboratory work.

UNITED STATES HISTORY.—Early American institutions and political history of the United States.

SHOP-WORK.—Woodwork: pattern-making finished. Metal-work: forging, molding, and founding.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

SENIOR YEAR**FIRST TERM**

LANGUAGE.—Rhetorical principles, structure of the English language, essay-writing. English classics.

MATHEMATICS.—Algebra: binomial theorem, permutations, theorem of indeterminate coefficients, par-

tial fractions, vanishing fractions, theory of equations, summation of series. Plane Trigonometry, including the solution of right and oblique triangles.

DRAWING.—Mechanical, architectural.

SCIENCE.—Outlines of general physics—lectures, recitations, and laboratory work.

ELEMENTARY POLITICAL SCIENCE.—Civics. Practical economics.

THEORY AND PRACTICE OF THE STEAM-ENGINE.

SHOP-WORK.—Machine-work.

BUILDING CONSTRUCTION AND TESTING-MACHINES.

SECOND TERM

LANGUAGE.—Essay-writing. Historical outlines of English and American literature. English classics.

MATHEMATICS.—Theoretical mechanics: elements of statics and dynamics. Plane surveying, with field work.

DRAWING.— Mechanical. Graphical statics. Architectural styles.

SCIENCE.—Outlines of general physics—lectures, recitations.

ELEMENTARY POLITICAL SCIENCE.—Comparative government. American political parties.

APPLIED ELECTRICITY.—The phenomena and simpler laws of electrostatics, magnetism, current electricity. The application of electrostatic and magnetic phenomena to useful purposes. Methods of current distribution and descriptions of their application to lighting, power, etc. Electrical laboratory work.

THEORY AND PRACTICE OF THE STEAM-ENGINE.

SHOP-WORK.—Machine-work.

PUBLIC SPEAKING, once a week throughout the year.

The following tables give the distribution of time for the several subjects of instruction:

JUNIOR YEAR

Subject	No. of hours per week	
	1st Term	2d Term
English Language.....	3	3
Mathematics.....	5	5
Mechanical Drawing.....	6	6
Free-hand Drawing.....	2	2
General History.....	2	2
Shop-Work in Wood—Joinery.....	5	5
Shop-Work in Iron—Bench-Work.....	5	5
Gymnasium.....	2	2
	30	30

MIDDLE YEAR

Subject	No. of hours per week	
	1st Term	2d Term
English Language and Literature.....	2	2
Mathematics.....	5	5
Mechanical Drawing.....	4	4
Descriptive Geometry.....	1	1
Free-hand Drawing.....	1	1
Chemistry—Lectures and Laboratory.....	5	5
General History.....	2	2
Shop-Work in Wood—Turning, Pattern-making.....	4	4
Shop-Work in Iron—Forging.....	4	4
Gymnasium.....	2	2
	30	30

SENIOR YEAR

SUBJECT	No. of hours per week	
	1st Term	2d Term
English Language and Literature	2	2
Mathematics	5	5
Mechanical Drawing	5	5
Physics—Lectures and Recitations	3	3
Physics—Laboratory	4	4
Elementary Political Science	2	2
Steam-Engine	1	1
Shop-Work—Machine-Shop	5	5
Building Construction and Testing-Machines	2	—
Graphical Statics	—	2
Public Speaking	1	1
	30	30

Students attend five days a week, from 9 a. m. to 4 p. m.

The time of the student is about equally divided between the classroom and laboratory studies and the shop-work.

The scientific instruction is given chiefly by lectures and laboratory work, the text-book being used only for reference and review.

The English instruction, which is carried throughout the entire course, is thorough and comprehensive and furnishes a basis of sound liberal culture for all the other studies.

The practical instruction given in the shops affords a valuable aid to the scientific studies. It brings the student into direct and intimate relation with natural

forces, where a practical application of these studies is required. A good knowledge is imparted of the technical apparatus involved in the mechanic arts, which becomes of practical value as a means of general training, besides affording the best kind of preparation for advanced education in mechanical and electrical engineering.

The Institute reserves the right to retain drawings and products of the workshops, made by students.

Visits are made by the students, accompanied by the professors, from time to time, to the chief industrial establishments of the city and neighborhood.

DIPLOMA

A diploma is granted to students who complete the course and pass all the required examinations.

SPECIAL COURSES

Special courses can be arranged to suit the individual needs of students who are fitted to pursue them advantageously.

LABORATORIES AND WORKSHOPS

The chemical and physical laboratories are large, well-lighted, well-ventilated rooms, and are supplied with extensive collections of apparatus and with every appliance for the work done by the students.

The technical shops for woodwork, bench-work, machine-work, and forging are unsurpassed in the completeness and perfection of their appointments.

The electrical laboratories are finely-appointed rooms and are provided with a Corliss thirty-horse-power

engine, a Porter-Allen seventy-five-horse-power engine, an Armington-Sims twenty-horse-power marine engine, dynamos of the most recent design, storage batteries, and all the necessary apparatus and appliances for practical instruction in electrical science and its applications.

The extensive mechanical and electrical plant of the Institute building is also made available in the technical instruction.

GYMNASIUM

The Gymnasium is a large, airy room, completely equipped in accordance with the requirements of the Swedish system of physical training and with dressing-rooms, and bath-rooms supplied with hot and cold water. All the training is conducted under the immediate supervision of the Director.

LIBRARY, MUSEUM, AND PICTURE GALLERY

In connection with the work of the department, constant use is made of the Library, which contains thirty thousand volumes. The students have the use, also, of the Reading-room, which is well supplied with the best home and foreign periodicals relating to art, science, technology, and literature. The Museum and the Picture Gallery, with their extensive collections, furnish excellent opportunities for general culture.

ADMISSION

Students must have at least a good elementary education. The examination for admission includes Eng-

lish grammar and composition, arithmetic, geography, and United States history. Advanced standing can be taken by students possessing the requisite qualifications. Entrance examinations are held in June and September.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEEES AND TERMS

First term of each year, *thirty-eight dollars*; second term, *thirty-seven dollars*.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

All materials and tools used in the chemical, physical, and electrical laboratories, and in the workshops, are supplied by the Institute. Students are responsible, however, for their own breakage in the laboratories and workshops. A deposit of *fifty cents* is required the first year, as security for the return of the locker key. A deposit of *five dollars* is required at the beginning of the second and the third year, which is returned at the close of the year, less the cost of the apparatus destroyed.

Students supply their own text-books and drawing instruments.

There are two terms in the year, beginning, respectively, in September and February.

COURSE IN MECHANICAL DRAWING

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

THOMAS SMITH, B. S., M. E.,
Professor of Mechanical Drawing, in charge.

HOMER J. HOTCHKISS, A. M., M. M. E.,
Professor of Physics.

_____,
Professor of Mathematics.

JOHN T. HOLDSWORTH,
Professor of Commercial Geography and Banking.

HOWARD H. DENN,
Instructor in Mechanical Drawing.

KATHARINE D. BROWN, B. S.,
Instructor in Mathematics.

MARTHA G. ALLEN,
Instructor in Mathematics.

CLEMENT E. MOSSOP,
Instructor in Ironwork and Machine Construction.

R. WILLETTE CLINGER,
Instructor in Woodwork and Pattern-making.

THOMAS MC CREIGHT,
Instructor in Forging.

J. PETERSON RYDER, S. B.,
Director of Physical Training.

The Course in Mechanical Drawing is intended for the training of mechanical draftsmen. The instruction

¹ Vacancy to be supplied.

is comprehensive and thorough and aims to qualify young men for the successful prosecution of an occupation in which there is a constant demand for well-trained workers. The course extends through two years, each year being divided into two terms. More than half of the student's time is devoted to mechanical drawing.

COURSE OF INSTRUCTION

JUNIOR YEAR

FIRST TERM

DRAWING.—Mechanical: the use of instruments; lines and measurements; orthographic projection as far as the intersection and development of pyramids. Free-hand drawing. Exercises in lettering.

MATHEMATICS.—Review of arithmetic, giving special attention to decimals, ratio and proportion, percentage, square root; metric system, practical measurements. Elementary algebra through simple fractional equations of one unknown quantity.

SHOPWORK.—Elementary exercises in woodwork. Joinery and turning. Forging.

SECOND TERM

DRAWING.—Mechanical: intersections completed; the cycloid, epicycloid, hypocycloid, and involute curves; their application to spur and bevel-gear drawing. Free-hand drawing. Exercises in lettering. Line shading.

MATHEMATICS.—Algebra through quadratics, including proportion and plotting of equations. Practical geometry.

COURSE IN MECHANICAL DRAWING

101

SHOPWORK.—Exercises in woodwork. Pattern-making. Forging.

PHYSICAL TRAINING in the Gymnasium, twice a week during the year.

SENIOR YEAR

FIRST TERM

MECHANICAL DRAWING.—Worm-gears, sketching from machines, making assembled drawings from sketches and working drawings, and machine designs. Descriptive geometry. Exercises in lettering.

MATHEMATICS.—Essentials of plane trigonometry, including drill in use of logarithmic tables and solution of right and oblique triangles. Practical geometry and mensuration of surfaces and solids.

PHYSICS.—Lectures and laboratory work, consisting of manipulation and measurements.

SHOPWORK.—Chipping and filing.

THEORY AND PRACTICE OF THE STEAM-ENGINE.

SECOND TERM

MECHANICAL DRAWING.—Work from sketches: complete drawings; the designing of a machine to be constructed in the machine-shop. Descriptive geometry. Graphic statics. Exercises in lettering.

MATHEMATICS.—Elementary mechanics. Elements of plane surveying and leveling—recitation and field-work.

PHYSICS.—Recitations and laboratory work, consisting of manipulation and measurements.

SHOPWORK.—Machine-work. Exercises on machine tools.

THEORY AND PRACTICE OF THE STEAM-ENGINE.
LECTURES ON BUSINESS FORMS AND CUSTOMS.

CERTIFICATE

A certificate is given to students who complete the course of instruction and pass the required examinations.

SPECIAL COURSES

Special courses can be arranged to suit the needs of individual students.

The drawing-rooms, workshops, and physical laboratory are unsurpassed in the completeness and perfection of their appointments.

Students attend five days a week, from 9 a. m. to 4 p. m.

The Institute reserves the right to retain drawings and products of the workshops, made by students.

ADMISSION

Applicants must have at least a good elementary education. An entrance examination in arithmetic through percentage is required.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

The fee for the course is *twenty-five dollars* per term.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

The materials and tools used in the physical laboratory and the workshops are supplied by the Institute. Students are responsible, however, for their own breakage in the laboratories and workshops. A deposit of *five dollars* is required at the beginning of the second year, which is returned at the close of the year, less the cost of the apparatus destroyed.

No additional fee is charged for the training in the Gymnasium or the use of the baths.

Students supply their own text-books and drawing instruments.

There are two terms in the year, beginning, respectively, in September and February.

EVENING CLASSES

From the first of October until the end of March, courses of instruction in Mechanical Drawing, Mathematics, Physics, Shopwork, and Machine Construction are open to students in the evening. Full details will be found on page 253.

COURSE IN MACHINE CONSTRUCTION

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

LIEUTENANT WILLIAM L. BAILIE, U. S. N., Director,
Lecturer on the Theory and Practice of the Steam-
Engine.

HOMER J. HOTCHKISS, A. M., M. M. E.,
Professor of Physics.

THOMAS SMITH, B. S., M. E.,
Professor of Mechanical Drawing.

¹ _____,
Professor of Mathematics.

JOHN T. HOLDSWORTH,
Professor of Commercial Geography and Banking.

KATHARINE D. BROWN, B. S.,
Instructor in Mathematics.

HOWARD H. DENN,
Instructor in Mechanical Drawing.

MARTHA G. ALLEN,
Instructor in Mathematics.

CLEMENT E. MOSSOP,
Instructor in Benchwork and Machine Construction

R. WILLETTE CLINGER,
Instructor in Woodwork and Pattern-making.

THOMAS Mc CREIGHT,
Instructor in Forging.

J. PETERSON RYDER, S. B.,
Director of Physical Training.

¹ Vacancy to be supplied.

The course in Machine Construction provides instruction in the theory of machinery, and practical training in the designing and construction of machines. It is especially adapted to young men who wish to prepare themselves for positions of responsibility in mechanical establishments. It gives them a practical working knowledge of shopwork, mathematics, mechanical drawing, and physics, as applied to the designing and construction of machinery. It also offers to those who cannot take an advanced technical course the opportunity of fitting themselves in two years for occupations in which advancement depends upon a knowledge of general scientific principles as well as upon the technical skill derived from thorough systematic training in the workshop.

COURSE OF INSTRUCTION

The course of instruction occupies two years.

JUNIOR YEAR

FIRST TERM

SHOPWORK.—Woodwork. Benchwork in iron. Forging. Students complete the elementary exercises during this term.

MECHANICAL DRAWING.—The use of instruments; orthographic projection as far as the intersection and development of prisms. Exercises in lettering.

MATHEMATICS.—Review of arithmetic, giving special attention to decimals, ratio and proportion, percentage, square root; metric system, practical measurements. Elementary algebra through simple fractional equations of one unknown quantity.

SECOND TERM

SHOPWORK.—Elementary exercises in woodwork. Benchwork in iron. Forging. During this term the student completes some project which has been designed in the drawing-room, and unless the realization of the project includes key-fitting, special instruction is given in the same.

MECHANICAL DRAWING.—Intersections completed. The cycloid, epicycloid, hypocycloid, and involute curves; their application to spurs and bevel-gears. Logarithmic and Archimedean spirals and their application to cams. Exercises in lettering.

MATHEMATICS.—Algebra through quadratics, including proportion and plotting of equations. Practical geometry.

PHYSICAL TRAINING in the Gymnasium, twice a week during the year.

SENIOR YEAR**FIRST TERM**

SHOPWORK.—Woodwork: pattern-making. Forging. Machine-work both in operating and constructing.

MECHANICAL DRAWING.—Line shading. Sketching from machines; making assembled drawings of machines from sketches. Worm and worm-gears. Exercises in lettering. Descriptive geometry.

MATHEMATICS.—Essentials of plane trigonometry, including drill in use of logarithmic tables and solution of right and oblique triangles. Practical geometry and mensuration of surfaces and solids.

PHYSICS.—Recitations and laboratory work consisting of manipulation and measurements.

THEORY AND PRACTICE OF THE STEAM-ENGINE.

SECOND TERM

SHOPWORK.—Woodwork: pattern-making. Machine-work: assembling; worm and gear work. Forging.

MECHANICAL DRAWING.—Problems in the construction of machines. Graphic statics. Descriptive geometry. Exercises in lettering.

MATHEMATICS.—Elementary mechanics. Elements of plane surveying and leveling—recitation and field-work.

PHYSICS.—Lectures and laboratory work consisting of manipulation and measurements.

THEORY AND PRACTICE OF THE STEAM-ENGINE.

LECTURES ON BUSINESS FORMS AND CUSTOMS.

CERTIFICATE

A certificate is granted to students who complete the course of instruction and pass all the required examinations.

SPECIAL COURSES

Special courses can be arranged to suit the needs of individual students.

ATTENDANCE

Students attend five days a week, from 9 a. m. to 4 p. m.

The time is so divided that the knowledge acquired in the classrooms is graphically illustrated by the work in the shops.

EQUIPMENT

The machine-shop is a large and finely-appointed room and is furnished with the following machines

from the best makers in the country—Brown & Sharpe; Bement, Miles & Co.; and William Sellers & Co.: four thirteen-inch lathes, one sixteen-inch lathe, one twenty-one-inch lathe, one No. 4 universal milling machine, one mandril grinder, one six-inch slotter, one twenty-five-inch planer, one sixteen-inch vertical drill, one Dwight No. 4 sensitive drill, one six-inch and three thirteen-inch screw-cutting lathes. In addition to these, there are now in use in the machine-shop the following tools which have been designed and built by the students of the Institute: three thirteen-inch screw-cutting lathes, one sixteen-inch and one six-inch screw-cutting lathe, two ten-inch shapers, one motor for driving tool-grinder, one motor for driving circular saw, two sensitive-drill presses, one hydraulic mandril press, two ten-inch chuck lathes, one wet and dry emery grinder, one twelve-horse-power compound marine engine. The motive power of the machine-shop is supplied by three five-horse-power electric motors, designed and built by the students.

The technical shops for woodwork, benchwork, and forging are unsurpassed in the completeness and perfection of their appointments.

The physical laboratories are supplied with extensive collections of apparatus and with every appliance necessary for the work to be done by the students.

ADMISSION

For admission to the regular course, applicants must have a good elementary education. An entrance examination in arithmetic through percentage is required.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

The fee is *twenty-five dollars* per term.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

The materials and tools used in the chemical, physical, and electrical laboratories, and in the workshops, are supplied by the Institute. Students are responsible, however, for their own breakage in the laboratories and workshops. A deposit of *five dollars* is required at the beginning of the year, which is returned at its close, less the cost of the apparatus destroyed.

No additional fee is charged for the training in the Gymnasium or the use of the baths.

Students supply their own text-books, paper, and drawing instruments.

The Institute reserves the right to retain drawings and products of the workshops, made by students.

There are two terms in the year, beginning, respectively, in September and February.

EVENING CLASSES

From the first of October until the end of March, a course of instruction, covering nearly the same ground as the regular course, is open to students in the evening. Full details will be found on page 254.

COURSES IN MATHEMATICS

INSTRUCTORS

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

KATHARINE D. BROWN, B. S.,
Instructor in Mathematics.

_____,¹
Instructor in Mathematics.

MARTHA G. ALLEN,
Instructor in Mathematics.

COURSES OF INSTRUCTION

ALGEBRA

- I. Algebra to simple fractions, including the solution of some simple equations of the first degree. Five hours a week throughout the first term of each year.
- II. Algebra continued to the theory of exponents. Three hours a week throughout the second term of each year.
- III. Theory of exponents, radicals, quadratic equations, plotting of equations, use of logarithms, imaginaries, proportion. Three hours a week throughout the first term of each year.
- IV. Proportion continued, the progressions, variation, inequalities, and general review of first term's work. One hour a week throughout the second term of each year.

¹ Vacancy to be filled

- V. Binomial theorem, permutations, indeterminate coefficients, partial fractions, vanishing fractions, convergency and divergency of series, summation of series, theory of equations. Two hours a week throughout the first term of each year.
- VI. Elementary course in the essentials of algebra through quadratics, running throughout the year. Five hours a week the first term, two hours the second term. Required of students in Architecture, Machine Construction, and Mechanical Drawing.

GEOMETRY

- I. Plane Geometry—the straight line. Two hours a week throughout the second term of each year.
- II. Plane Geometry—the circle, similar figures. Two hours a week throughout the first term of each year.
- III. Plane Geometry completed; Solid Geometry. Four hours a week throughout the second term of each year.
- IV. Practical Geometry—an elementary course in concrete geometry and mensuration, as a preparation for an elementary course in trigonometry. Beginning the second term of each year and continuing two terms. Two hours a week.

TRIGONOMETRY

- I. Plane and Spherical Trigonometry, including the solution of right and oblique triangles, and simple practical problems in geography, astronomy, and navigation. Three hours a week throughout the first term of each year.
- II. A short elementary course in the essentials of Plane Trigonometry, sufficient to prepare for Mechanics II and Surveying II. Two hours a week throughout the second half of the first term of each year.

MECHANICS

- I. A course in the elements of Theoretical Mechanics, treating of statics and dynamics. The work embraces the following subjects:

Statics.—Composition and resolution of forces, moments, couples, equilibrium of a rigid body under the action of three forces, friction, and work.

Dynamics.—Laws of motion, motion of a body under the action of gravity, impulse, work, energy, uniform motion in a circle, projectiles. Two hours a week throughout the second term of each year.

This course requires previous knowledge of Algebra I and II, Geometry I, II, and III, Trigonometry I.

- II. A more elementary course in Theoretical Mechanics, for students who have taken Algebra V,

Geometry V, and Trigonometry II. Two hours a week throughout the second term of each year.

SURVEYING

- I. An elementary course in land surveying, direct leveling, topographical surveying, map drawing, preliminary railroad surveying. Recitation and field work. This course, running two hours a week throughout the second term of each year, requires a thorough knowledge of Algebra III, Geometry III, Trigonometry I.
- II. An elementary course in land surveying and direct leveling. Recitation and field work. Two hours a week throughout the second term of each year.

PRACTICAL CALCULUS

A short introduction to Analytics. This is followed by the Calculus and Analytics, which are combined, using the calculus as an early aid in the derivation of the important formulae in the geometry.

The course embraces differential and integral calculus, with application to centre of gravity, moment of inertia, mean value, intrinsic equation, differential equations.

Five hours a week throughout the year.

All the above courses are required of students in Electrical Engineering. The courses in Analytical Geometry and Calculus are not required of students in Mechanic Arts, Machine Construction, and Mechanical Drawing.

CERTIFICATE

Certificates are granted to students who complete all the courses and pass the required examinations in the same.

. REQUIREMENTS FOR ADMISSION

A knowledge of Arithmetic through percentage is required for admission to Course I in Algebra. For admission to the other courses, a satisfactory examination must be passed in all the work of the previous courses.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Ten dollars per term for any two of the courses. The fee is the same for one course.

Students supply their own text-books and stationery.

There are two terms in the year, beginning, respectively, in September and February.

EVENING COURSES

The above courses are offered also during the evening session, with some modifications. Full details will be found on page 236.

COURSES IN PHYSICS

INSTRUCTORS

HOMER J. HOTCHKISS, A. M., M. M. E.,
Professor of Physics.

FLOYD K. RICHTMYER, A. B.,
Instructor in Physics.

COURSES OF INSTRUCTION

I. INTRODUCTORY PHYSICS.

- A. Elements of Mechanics and Heat.
- B. Introductory Laboratory Practice.

II. ELEMENTARY PHYSICS.

- A. Elementary Theory of Physics.
- B. Introductory Experimental Physics.
- C. Lectures with experiments.

III. ADVANCED PHYSICS.

- A. General Physics.
- B. Experimental Physics.

IV. ADVANCED EXPERIMENTAL PHYSICS.

I. INTRODUCTORY PHYSICS

A short Course in Mechanics and Heat, consisting of two parts, as follows:

I. A. One recitation per week, for two terms.

I. B. One three-hour laboratory period per week, for two terms.

The preparatory Mathematics should include Algebra through quadratics, and the elements of Plane Geometry. The elements of Plane Trigonometry are helpful, if taken with or before this course.

It is expected that from one and one-half to two hours will be devoted to preparation for each recitation; and from one to two hours a week, besides the laboratory period, to study and report writing on the experiments, unless the full amount of work can be satisfactorily done in less time.

This course is intended primarily for students in the Mechanical Drawing and Machine Construction courses. It is designed to train the student in habits of careful manipulation, accurate observation, and systematic thinking and doing, by making laboratory practice a large part of the work. The laboratory work serves also to give the student a clearer knowledge of the more important topics under the subjects studied, by the continual application and use of the definitions, principles, and laws learned in the classroom; and acquaints him with laboratory methods essential for profitable work. The aims of the course, it is thought, are best accomplished by a series of experiments covering rather fully the subjects of Mechanics and Heat, which involve quantitative measurements, and include the foundation needed for studying the other subjects.

II. ELEMENTARY PHYSICS

The Elements of Mechanics, Heat, Magnetism, and Electricity. Class-work, Laboratory, and Lectures, as follows:

II. A. Elementary Theory of Physics. Two recitations per week, for two terms.

II. B. Introductory Experimental Physics. One three-hour laboratory period per week, for two terms.

II. C. Lectures with Experiments. One lecture per week, for two terms.

The mathematical preparation should include a good knowledge of Algebra and Plane Geometry. Plane Trigonometry should be taken with or before this course. No previous study in Physics is required.

Part B may be taken after parts A and C, or their equivalents, if desired.

Students who have completed Course I may substitute it for the first term, part B, Course II.

It is expected that from one and one-half to two hours will be given to the preparation of each recitation, and from one and one-half to three hours a week, besides the laboratory period, to study and report writing on the experiments, unless the full amount of work can be satisfactorily done in less time. Brief clear notes on the lectures should be recorded.

The most difficult parts of the subjects included in this first year's work are omitted, in order that the student may thoroughly master what is taken. The topics treated are chosen with reference to their importance and bearing on the later work of the student.

The purpose is to familiarize the student with the principal facts, definitions, laws, and relations of quantities; to teach him how to apply these facts in the solution of problems; and to acquaint him with the method of obtaining, from definitions or experimental data, the relations of quantities that are necessary for the solution of practical problems. The ability to apply in practice what is learned is made the principal test of a satisfactory knowledge of the subjects studied.

The laboratory and the classroom work run nearly parallel and supplement each other. In the laboratory the student has opportunity to apply much that is learned in class; to study the methods essential for successful experimentation; to learn how to express the results of experiments by plotted curves, tabulation, or diagrams, and to interpret and draw conclusions from the results so represented. The sources of error are sought and the means or methods by which the errors may be eliminated or made so small that they may be neglected, are also taken up. The accuracy desirable or attainable in the experiments is considered and the degree to which the computed result may be relied upon is expressed.

An effort is made to cultivate self-reliance and independence in thinking and reasoning, also the ability to deal successfully with difficulties or to devise means of removing them.

III. ADVANCED PHYSICS

Mechanics, Heat, Sound, and Light are studied in class and laboratory, as follows:

III. A. General Physics. Two recitations per week, for two terms.

III. B. Experimental Physics. One three-hour laboratory period per week, for two terms.

A knowledge of Course II or its equivalent is required for entering Course III. Part B may be taken after part A, or its equivalent, if desired.

This second year's work is a continuation of Course II, and includes a more advanced and thorough study of the subjects named.

The time to be devoted to the preparation of lessons and reports on experiments is the same as for Course II.

The laboratory work in both Courses II and III is quantitative in character, and is intended to give a good foundation for subsequent experimentation or research. As the work progresses, the student becomes familiar with the uses and manipulation of the more delicate and precise instruments of measurement with which the laboratory is well equipped.

IV. ADVANCED EXPERIMENTAL PHYSICS

Three to six hours per week, for one or more terms, may be taken by special arrangement. The course provides for students who desire to make a special study of Experimental Physics, or wish to prepare for teaching Physics. The preparation should include the equivalent of Courses II and III.

EQUIPMENT

The Physical Laboratory is on the second floor of the Main Building, directly over the front entrance. The main laboratory is a large, well-lighted room (40 x 40 ft.), well equipped with work-tables, gas and electrical connections, lockers for ninety-six students, apparatus cases and cabinets, standard clock, and various pieces of apparatus permanently mounted on the walls. There is a large supply of enclosed balances for general use in the laboratory. High-grade chemical balances are available for more accurate weighing in another room. Adjoining the main laboratory are four smaller rooms—the office, the apparatus and supply room, and two smaller rooms for experimental work. These small rooms can be darkened when desired. One of them contains a fully-equipped motor-driven lathe, cases of metal- and wood-working tools, stock of materials, etc.; also a set of weather-bureau apparatus, including instruments for autographic records of barometric pressure, wind velocity and direction, rainfall, and sunshine; high-grade Fortin and Aneroid barometers, a standard anemometer, various forms of hygrometers, maximum and minimum thermometers, etc.

Among the more valuable pieces of apparatus for experiments in light are: A Genève Société Optical Bench, with a complete set of attachments and accessories; apparatus for projection of polarization and double refraction phenomena, also for microscopic projection; a Reichert microscope with a large set of slides; comparator microscopes with micrometer

attachments; mounted telescopes, several forms of spectroscopes, spectrometers, and polariscopes; several sets of lenses for various purposes—some sets achromatic; special prisms, diffraction gratings, a large variety of vacuum tubes, a large induction coil, and many less expensive but very useful pieces of apparatus in the same line.

There is also a good equipment of lecture-room and laboratory apparatus for mechanics of solids and fluids, heat, and sound; for example, among the apparatus for measurements of length are a dividing engine, a cathetometer, and a comparator with a standard meter-bar.

The Lecture-room is on the same floor, in the southeast corner of the Main Building. The lecture-table has water, gas, and electrical connections to batteries, dynamos, etc. A large apparatus-case contains part of the apparatus for lecture experiments.

ADMISSION

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Course I, *ten dollars* per term.

Course II, *fifteen dollars* per term, or *five dollars* for each part of a course, per term.

Course III, *twelve dollars* per term, or *six dollars* for each part of a course, per term.

Course IV. The fee corresponds to the amount of work undertaken.

A deposit of *five dollars*, to cover breakage in the laboratory, is required of each student. This is returned at the close of the year, less the cost of the apparatus injured.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

Students supply their own text-books and stationery.

There are two terms in the year, beginning, respectively, in September and February.

EVENING COURSES

Courses in General Physics are given during the winter months, full information concerning which will be found on page 237.

COURSES IN CHEMISTRY

INSTRUCTORS

- ERNEST ARNOLD CONGDON, Ph. B.,
Professor of Chemistry.
- ABRAHAM HENWOOD, B. S.,
Assistant Professor of Chemistry.
- ROLAND W. WHITE,
Laboratory Assistant.
-

COURSES OF INSTRUCTION

- I. GENERAL CHEMISTRY.
- II. QUALITATIVE ANALYSIS.
- III. QUANTITATIVE ANALYSIS.
- IV. ORGANIC CHEMISTRY.
- V. LECTURES ON THE CHEMISTRY OF FOODS AND DIETETICS.
- VI. LECTURES ON TEXTILES, DYEING, AND CLEANSING.
- VII. APPLIED ELECTRO-CHEMISTRY.
- VIII. SPECIAL COURSES.

I. GENERAL CHEMISTRY

A course of lectures and laboratory work extending through one year, with oral and written examinations. Two lectures, two laboratory periods, and one recitation per week.

The lectures are fully illustrated by experiments, charts and diagrams, specimens, and lantern views.

The instruction is made thorough and practical by constant personal supervision in the laboratories.

The student is trained to obtain by induction the more important principles of the science, to study the comparative properties of substances, and particularly to acquire a scientific habit of thought. Many problems are introduced throughout the course.

Notes are taken by the students at the lectures and in the laboratory, and complete records of their laboratory work, including descriptions and sketches, are kept in books which are examined weekly.

II. QUALITATIVE ANALYSIS

This course extends through one year, and consists of lectures and laboratory work, with frequent oral, and occasional written, examinations. One lecture and one laboratory period per week.

The student first studies the reaction of the more common metals. After this preliminary work, he analyzes solutions containing the metals, beginning with the separate groups of metals, and afterwards analyzing solutions containing all the metals studied.

In like manner the acids are next studied. The student then proceeds to analyze solutions that may contain all of the bases and acids studied; after which, general miscellaneous qualitative work is taken up, such as the examination of powders, insoluble substances, alloys, and such special work as time permits.

III. QUANTITATIVE ANALYSIS

There are three courses in Quantitative Analysis.

A. GENERAL COURSE

The instruction extends over two years, and consists of lectures, recitations, and laboratory work. The laboratory work aims to be thorough and sufficiently comprehensive—including pure salts, minerals and ores, alloys, water, gas, and technical products.

The lectures and recitations cover the methods used for the determination and separation of the common elements in their various forms of combination. A thorough drill in stoichiometric problems is also made an important feature of the work.

The laboratory work is individual in its character—the progress of the student depending upon his ability and industry.

B. TECHNICAL ANALYSIS

This course is designed to meet the needs of engineering students. It is limited in its scope, embracing only what are regarded as essentials.

Fuel.—Proximate analysis of coal; moisture, volatile matter, coke, ash, and sulphur. Specific gravity and calorific value.

Gas.—Flue and illuminating gas, employing the Elliot, Fisher-Orsat, and Hempel forms of apparatus.

Water.—Determination of hardness, and quantities of correcting materials required.

Lubricating Oil.—Specific gravity, viscosity, cold test, flashing point, loss in weight on exposure to elevated temperatures, percentage of mineral and fatty oil, free acid, suspended matters.

One laboratory period and one recitation per week throughout the term.

C. FOOD ANALYSIS

Practical laboratory experience with the processes in present use for the analysis of food materials is made the basis of the instruction.

The laboratory work is of such a character as to furnish data for the calculation of food values as well as to detect adulterations.

The following list indicates the general scope of the quantitative work: Chemically pure salts; potable water; common salt; bicarbonate of sodium; flour or bread; baking-powders; sugar or syrups; milk; butter; lard; cheese; tea; coffee; chocolate.

IV. ORGANIC CHEMISTRY

The Chemistry of the Hydrocarbons and their derivatives.

The course embraces lectures and laboratory work, with frequent oral, and occasional written, examinations. One lecture and two laboratory periods per week

The lectures are based upon a printed syllabus, prepared especially for the use of students.

V. LECTURES ON THE CHEMISTRY OF FOODS AND DIETETICS

A course of twelve lectures.

In this course the subject is treated, so far as possible, from the chemical standpoint. The chemical composition and relationship of substances used as foods are explained, as well as the changes brought about by the application of heat (as in cooking), and also changes produced by other means, such as vital forces, fermentation, and the general chemical reactions of bodies.

The following subjects are included in the lectures: Definitions of foods—chemical composition of food materials and of the human body; proximate food principles—protein, fats, carbohydrates, water, mineral matter; value of foods; use of calories; nutrient ratio; metabolism of foods; diet and dietaries; food materials—water (potable and mineral), common salt, starch foods, sugars, fats and oils, cereals, meats, eggs, fish, fruits, vegetables, salads, beverages, food adjuncts; study of fermentation; preparation of food materials; changes that foods undergo in cooking processes.

A syllabus of the course has been prepared for the use of students.

VI. LECTURES ON TEXTILES, DYEING, AND CLEANSING

This course includes a brief historical sketch of the use of textiles and the art of dyeing.

This is followed by a description of the more important textiles—cotton, flax, ramie, wool, and silk—and of the microscopical and chemical methods of distinguishing between them.

The materials used in dyeing and the operations preliminary to it, and the chemistry of washing, cleansing, bleaching, and dyeing are explained.

Some account is given of the natural and artificial coloring matters, and of the chemistry of the coal-tar colors, which completes the course.

VII. APPLIED ELECTRO-CHEMISTRY

This course is designed for Electrical Engineers and students of Technical Chemistry. Instruction is given by means of lectures, recitations, and problems in design of apparatus and processes.

Its scope is indicated by the following list of topics: General principles and theory; refining of metals by electrolysis of aqueous solutions; refining of metals by electrolysis of fused electrolytes; electric furnace; electro-deposition; alkali, chlorine, etc.; organic compounds and other chemicals; efficiency of methods.

Blount's "Practical Electro-Chemistry" is the guide employed.

VIII. SPECIAL COURSES

In addition to the regular courses offered, special courses may be arranged for those students desiring to devote more than the allotted time to the subject, or for students desiring to pursue special lines of work beyond that laid down in the regular courses.

Opportunity is offered for advanced work in experimental chemistry, to those competent to pursue such work.

The attention of teachers and of persons intending to become teachers is particularly called to the opportunities offered for qualifying themselves for advanced work in their profession. Every possible endeavor will be made to arrange the work and the time to suit the individual needs of such persons.

CERTIFICATE

Certificates are granted to students who complete Courses I, II, III, and IV, and pass the required examinations in the same.

LABORATORIES

The Laboratories are large and well-appointed rooms. The General Laboratory has accommodations for one hundred and seventy students. The ventilation is excellent—a most important feature and one that bears directly on the comfort and health of the students. The special features of the laboratory are: the placing of the sinks upon the desks, so that every four students use the same sink; the fume closets or hoods, which are perfectly arranged and, by means of an artificial draft, carry off all noxious vapors and acid fumes; the shelving on each desk holding the reagent bottles, arranged in such a manner as not to interfere with the supply of light.

The Quantitative Laboratory, which has accommodations for sixty students, is equally well-appointed.

REQUIREMENTS FOR ADMISSION

No previous knowledge of Chemistry is required for admission to the General Course, but a knowledge of the metric system is essential.

For admission to the Second Course, students must have completed the General Course or its equivalent.

The Third and Fourth Courses may be taken in order by students who have completed the first two courses or their equivalents.

A knowledge of General Chemistry is required for admission to the lectures on the Chemistry of Foods.

No special preparation is required for admission to the Lectures on Textiles, Dyeing, and Cleansing.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEEES AND TERMS

Courses in General Chemistry, Qualitative Analysis, Quantitative Analysis, and Organic Chemistry, each *twelve dollars* per term.

For the courses of lectures in the Chemistry of Foods and in Textiles, Dyeing, and Cleansing, each *two dollars*.

Students supply their own text-books and stationery.

Common chemicals used in the laboratory are supplied to the students free of charge.

A deposit of *five dollars*, to cover breakage of apparatus, is required of each student taking the laboratory work. This is returned at the close of the year, less the cost of the apparatus destroyed.

Each student is charged *fifty cents* per term for the use of a coat-locker, with individual combination lock, which gives him the absolute control of his own property.

There are two terms in the year, beginning, respectively, in September and February.

EVENING COURSES

Courses in Elementary and Advanced Chemistry, with laboratory work, are given from the beginning of October until the end of March. Full details will be found on page 238.

DEPARTMENT OF COMMERCE AND FINANCE

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

PARKE SCHOCH, A. M., Director,
Professor of the History and Mechanism of Commerce,
and Stenography.

CHARLES D. CLARKSON,
Professor of the Theory and Practice of Accounts.

CARL LEWIS ALTMAIER,
Professor of Commercial Law and Instructor in Corre-
spondence and Typewriting.

JOHN T. HOLDSWORTH,
Professor of Commercial Geography and Banking.

WILLIAM G. HAIMES,
Professor of Spanish.

CAROLYN H. LOCKE,
Instructor in Stenography.

ALICE ELIZABETH CHASE, B. A.,
Instructor in English.

LILLIAN M. DALTON,
Instructor in English.

MAUDE G. HOPKINS,

J. PETERSON RYDER, S. B.,
Directors of Physical Training.

The Department of Commerce and Finance is founded on a broad and liberal basis. In its general features it resembles the commercial schools of Europe

and is intended to place commercial education in its proper relation to other departments of educational work. The object of the course is to train young men to do business rather than simply to record business. The field of business will never be wholly occupied. It will always offer large privilege and rich reward to the right kind of ability. No other field presents larger inducements or implies greater responsibilities; no other field draws more largely upon the ranks of able and ambitious young men. Modern business has grown so complex and its requirements are so exacting that a knowledge of its laws, customs, and tendencies is necessary, not only to success, but to a comfortable existence. Every successful man is, in a sense, a successful business man.

The department has been organized with the view of meeting these conditions. It provides a liberal, and, at the same time, thoroughly practical course of study, including two years' training in a knowledge of the world's industries and their markets, the laws of trade and finance, and the mechanism and customs of business.

Our growing commercial relations with Spanish-speaking countries, especially Cuba, Puerto Rico, the Philippines, and the South American Republics, make it desirable that a knowledge of Spanish should form a part of the equipment of every young man entering commercial life. To meet these new conditions, the Spanish language, especially adapted to the needs of business, is given a place in the scheme of instruction.

Besides the systematic course of two years, there are three distinct Office Courses, each occupying one year

and leading directly to a specific line of employment. A course is offered for teachers who wish to fit themselves for commercial high-school work.

COURSES OF INSTRUCTION

The Department is organized, as follows:

- I. SCHOOL OF COMMERCE AND ACCOUNTS.
- II. COMMERCIAL COURSE FOR TEACHERS.
- III. OFFICE COURSES.
- IV. EVENING COURSES.

I. SCHOOL OF COMMERCE AND ACCOUNTS

The aim of the School of Commerce and Accounts is to give young men and young women thorough fundamental training for the activities of business, which include: (1) The production, manufacture, sale, and transportation of articles of commerce; (2) the management of stock companies and corporations; (3) the buying and selling of securities; (4) the importing and exporting of merchandise; (5) the borrowing and lending of money and credit; (6) the advertising of commercial concerns; (7) the keeping of business records; (8) a knowledge of the Spanish language.

The work of the course is divided into two years, as follows:

JUNIOR YEAR

FIRST TERM

ENGLISH LANGUAGE.—Composition; letter-writing. American classics.

COMMERCIAL ARITHMETIC.—Weights and measures; metric system; trade standards and prices; wages and pay-rolls; commercial interest and discount; speed practice.

BUSINESS CUSTOMS.—Invoices; commercial paper; bills of lading and manifests; vouchers.

BOOKKEEPING.—Principles and practice of single and double entry; simple transactions; business forms.

PENMANSHIP.—A plain, rapid business hand.

TYPEWRITING.—Word exercises; study of mechanism of machine; transcribing from rough draft.

CORRESPONDENCE.—Mechanical arrangement and style of business letter; exercises in condensing and expanding.

COMMERCIAL GEOGRAPHY.—Physical and mathematical geography in their relations to commerce. Commercial geography of the United States.

SPANISH LANGUAGE.—Elementary grammar, oral and written exercises; vocabulary.

SECOND TERM

ENGLISH LANGUAGE.—Grammatical principles; diction. Selected classics.

INDUSTRIAL ARITHMETIC.—Measurements; builders' and contractors' bids and estimates; scientific measurements; manufacturers' and mechanics' estimates; metric system.

136 DEPARTMENT OF COMMERCE AND FINANCE

BUSINESS CUSTOMS.—Securities; collections; discounts.

BOOKKEEPING.—Principles and practice of single and double entry in more complicated transactions. Shipments, consignments, and business forms.

COMMERCIAL CALCULATIONS.—Practical exercises for acquiring rapidity and accuracy of work.

COMMERCIAL GEOGRAPHY.—Industrial and economic geography of the United States, special attention being given to the new dependencies. Study of the world's commercial staples, raw and manufactured.

SPANISH LANGUAGE.—Grammar, oral and written exercises, vocabulary, reading; business letters and business forms.

PENMANSHIP.—Continued.

TYPEWRITING.—Continued.

CORRESPONDENCE.—Letters relating to contracts, purchases and sales, recommendations, introduction, credit; circulars, telegrams.

PUBLIC SPEAKING.—One hour a week throughout the year.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

SENIOR YEAR

FIRST TERM

ENGLISH LANGUAGE.—Rhetorical principles; synonyms; essay-writing.

ADVANCED BOOKKEEPING.—Importing and jobbing; wholesale and retail; manufacturing, real estate, joint-stock companies, corporations, banking, etc. Introducing order-book, cash-book, invoice and sales register, special-column journal, bill-book.

BANKING AND FINANCE.—Outlines of the history of banking and of the National banking system, state banks, savings-banks, trust and financial companies; foreign banking; banking in its relations to foreign trade.

COMMERCIAL ARITHMETIC.—Financial problems involving partial payments; buying and selling exchanges; stocks and bonds; equating of accounts; adjusting of partnership, joint-stock company, and corporation accounts.

COMMERCIAL GEOGRAPHY —A comparative study of the commerce and industry of the great commercial nations of the world.

HISTORY OF COMMERCE.—Outlines of the history of ancient, medieval, and modern commerce, with special reference to the history of American commerce.

CIVICS.—Principles and practical operation of government in the United States.

SPANISH LANGUAGE.—Grammar, conversation, reading, correspondence.

TYPEWRITING.—Arrangement of promiscuous matter.

SECOND TERM

ENGLISH LANGUAGE.—Paragraph—its sum and structure. Study of selected plays of Shakespeare.

ADVANCED BOOKKEEPING.—Continued.

COMMERCIAL ARITHMETIC.—Continued.

BANKING AND FINANCE.—Bank management, mechanism and practice of banking, the clearing house; currency reform.

COMMERCIAL GEOGRAPHY.—Continued. Special studies requiring independent research.

MECHANISM OF COMMERCE.—Boards of trade; stock and produce exchanges; transportation; interstate commerce; warehousing; importing and exporting; duties; exchange; mercantile agencies.

COMMERCIAL LAW.—Elementary principles of contracts and negotiable paper, and the leading principles which regulate the relations of the business man—principal and agent, carriers, commission merchants, partnerships, joint-stock companies, corporations.

CIVICS.—Principles and practical operation of government in the United States; history, principles, and organization of political parties; civil service; ballot systems; representation systems; municipal government.

BUSINESS PRINTING AND ADVERTISING.—Type and paper; printers' estimates; proofreading; business cards, circulars, and catalogues. Modern advertising, including mediums, rates, agencies.

SPANISH LANGUAGE.—Reading, conversation, correspondence.

PUBLIC SPEAKING.—One hour a week throughout the year.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

Students may elect to do special work in chemistry, at the discretion of the Director in charge.

The stereopticon is freely used in the classroom, as an aid in teaching the history and mechanism of commerce, commercial geography, and other subjects.

During the Senior Year, visits are made to some of the leading industrial and commercial establishments of Philadelphia, and systematic use is made of the Philadelphia Commercial Museums in the study of commercial geography.

Table showing the distribution of time for the several subjects of instruction:

JUNIOR YEAR

SUBJECT	No. of hours per week
English Language	2
Commercial and Industrial Arithmetic	4
Business Customs	1
Bookkeeping	5
Penmanship	2
Typewriting	2
Correspondence	1
Commercial Geography	2
Spanish Language	2
Public Speaking	1
Physical Training	2
Total	24

SENIOR YEAR

SUBJECT	No. of hours per week	
	1st Term	2d Term
English Language	2	2
Bookkeeping	3	3
Banking and Finance	1	1
Commercial Arithmetic	3	3
Commercial Geography	2	2
History of Commerce	2	—
Mechanism of Commerce	—	2
Civics	2	2
Spanish Language	2	2
Commercial Law	—	2
Business Printing and Advertising	—	1 ¹
Typewriting	2	—
Public Speaking	1	1
Physical Training	2	2
Total	22	23

¹ Part of the term.

DIPLOMA

The diploma of the Institute is granted to students who complete the work of the School of Commerce and Accounts and pass the prescribed examinations.

II. COMMERCIAL COURSE FOR TEACHERS

In order to meet the growing demand for specially trained commercial teachers, the Institute offers instruction to men and women who wish to equip themselves for entrance upon the new and widening field of commercial work in high schools and academies.

For admission to this course, the applicant must have had at least two years' experience in general teaching,

or must have been graduated from a state normal school of approved standing.

Students who enter this course are given special consideration by the professors and instructors of the department, generous assistance being given in methods of teaching, the preparation of outlines and courses, and the bibliography of the several subjects.

The Institute, in its complete reference libraries, its Museum, its courses of free public lectures and concerts, and its various departments of educational work, offers superior advantages to the student looking to teaching as a profession.

The course occupies one year, divided into two terms, and includes the following subjects:

ENGLISH LANGUAGE.—Rhetorical principles; essay-writing. Selected plays of Shakespeare.

BOOKKEEPING.—Principles and practice of single and double entry; business forms; importing and jobbing; wholesale and retail; manufacturing, real-estate, joint-stock companies; corporations; banking, etc. Introducing order-book, cash-book, invoice and sales register, special-column journal, bill-book.

COMMERCIAL ARITHMETIC.—Financial problems involving partial payments; buying and selling exchanges; stocks and bonds; equating of accounts; adjusting of partnership, joint-stock company, and corporation accounts.

BANKING AND FINANCE.—Outlines of the history of banking and of the national banking system, state banks, savings banks, trust and financial com-

panies; foreign banking; banking in its relations to foreign trade; bank management, mechanism and practice of banking; the clearing house; currency reform.

COMMERCIAL GEOGRAPHY.—Physical geography and mathematical geography in their relations to commerce. Industrial, commercial, and economic geography of the United States. Comparative study of the commerce and industry of the great commercial nations of the world. Special studies requiring independent research.

HISTORY OF COMMERCE.—Outlines of the history of ancient, medieval, and modern commerce, with special reference to the history of American commerce.

COMMERCIAL LAW.—Elementary principles of contracts and negotiable paper, and the leading principles which regulate the relations of the business man—principal and agent, carriers, commission merchants, partnerships, joint-stock companies, corporations.

MECHANISM OF COMMERCE.—Boards of trade; stock and produce exchanges; transportation; interstate commerce; warehousing; importing and exporting; duties; exchange; mercantile agencies.

CIVICS.—Principles and practical operation of government in the United States; history, principles, and organization of political parties; civil service; ballot systems; representation systems; municipal government.

DEPARTMENT OF COMMERCE AND FINANCE 143

STENOGRAPHY.—Theory of Pitman system. Special emphasis upon methods of teaching the subject.

TYPEWRITING.—Word exercises, letters, transcribing from rough draft, tabular matter, arrangement of papers. Instruction in duplicating processes; carbon work ; letter-press; office practice.

PENMANSHIP.—A plain, rapid business hand.

Should the student's time admit, the Spanish language may be added to the course.

Table of the distribution of time for the several subjects of instruction:

SUBJECT	No. of hours per week	
	1st Term	2d Term
Bookkeeping	3	3
Commercial Arithmetic	3	3
Commercial Geography	3	3
History of Commerce	2	—
Banking and Finance	1	1
English Language	2	2
Civics	2	2
Stenography	3	3
Typewriting	3	3
Commercial Law	—	2
Mechanism of Commerce	—	2
Penmanship	1	1
	23	25

DIPLOMA

The diploma of the Institute is granted to students who complete the Commercial Course for Teachers,

and prepare an acceptable thesis upon an assigned commercial topic.

III. OFFICE COURSES

Three distinct Office Courses are offered. These are thoroughly practical in character, and are adapted to prepare young men and young women for entering immediately upon the respective lines of employment to which the training leads.

SECRETARY COURSE

This course has been organized to respond to applications that are made to the Institute for clerks fitted to do work of a more general character and of a higher grade than that required in a purely business office. Applicants for admission must show by diploma or by examination that they possess an education of high-school grade.

The course occupies one year, divided into two terms, and includes the following subjects:

STENOGRAPHY.—*First Term*—Theory of Pitman system; daily drill in phonetics. *Second Term*—Practice of the art by means of carefully graded dictation exercises, and daily transcript of notes.

TYPEWRITING.—Word exercises, letters, transcribing from rough draft, tabular matter, arrangement of papers. Instruction in duplicating processes; carbon work; letter-press; office practice.

ENGLISH LANGUAGE.—Rhetorical principles; essay-writing; collection and arrangement of material; criticism of manuscript. English classics.

DEPARTMENT OF COMMERCE AND FINANCE 145

SPANISH LANGUAGE.—Grammar, oral and written exercises; reading, correspondence, business letters and business forms.

BUSINESS PRINTING.—Type and paper; printers' estimates; proofreading.

ACCOUNTS, BUSINESS FORMS AND CUSTOMS.—Elements of single and double entry bookkeeping; invoices, commercial paper, vouchers, etc.

CORRESPONDENCE.—Arrangement and style of business letters; letters of recommendation, introduction, etc.; circulars, telegrams.

PENMANSHIP.

PUBLIC SPEAKING.—One hour a week, for young men.

PHYSICAL TRAINING in the Gymnasium, twice a week.

Table of the distribution of time for the several subjects of instruction:

Subject	No. of hours per week
Stenography	9
Typewriting	5
English Language	2
Spanish Language	2
Accounts, Business Forms and Customs	1
Correspondence	1
Penmanship	1
Business Printing	1 ¹
Physical Training	2
Total	24

¹ Part of second term.

BOOKKEEPING COURSE

The object of this course is to prepare young men and young women for positions as bookkeepers. It occupies one year, divided into two terms, and includes the following subjects:

BOOKKEEPING.—Single and double entry; use of auxiliary books; order-books, cash-books, invoice and sales register, bill-book, special-column journal, etc.

COMMERCIAL ARITHMETIC.—Weights, measures; metric system; builders', manufacturers', mechanics' estimates; partial payments; exchanges, stocks, bonds, partnerships; joint-stock companies and corporations; speed practice.

BUSINESS FORMS AND CUSTOMS.—Invoices, commercial paper, bills of lading and manifests; vouchers.

ENGLISH LANGUAGE.—Composition; letter-writing; grammatical principles. American classics.

CORRESPONDENCE.—Arrangement and style of business letters; letters of recommendation, introduction, etc.; circulars, telegrams.

PENMANSHIP.—A plain, rapid business hand.

TYPEWRITING.—Word exercises; mechanism of machine; transcribing from rough draft; arrangement of papers.

PUBLIC SPEAKING.—One hour a week, for young men.

PHYSICAL TRAINING.—In the Gymnasium, twice a week.

Table of the distribution of time for the several subjects of instruction:

SUBJECT	No. of hours per week
Bookkeeping	8
Commercial and Industrial Arithmetic.....	5
Business Forms and Customs.....	1
English Language	2
Correspondence	1
Penmanship	2
Typewriting	3
Public Speaking	1
Physical Training	2
Total	25

STENOGRAPHY COURSE

The aim of this course is to train young men and young women for positions as stenographers. There is a growing demand among business men for stenographers who can not only take down and typewrite correspondence, but who have a serviceable knowledge of good English and who are intelligently trained along general educational lines.

The course occupies one year, divided into two terms, and includes the following subjects:

STENOGRAPHY.—*First Term*—Theory of Pitman system; daily drill in phonetics. *Second Term*—Practice of the art by means of carefully graded dictation exercises and daily transcript of notes.

148 DEPARTMENT OF COMMERCE AND FINANCE

TYPEWRITING.—Word exercises, letters, transcribing from rough draft, tabular matter, arrangement of papers. Instruction in duplicating processes; carbon work; letter-press; office practice.

ENGLISH LANGUAGE.—Composition; letter-writing; grammatical principles. Selected American or English poets.

ACCOUNTS, BUSINESS FORMS AND CUSTOMS.—Elements of single and double entry bookkeeping; invoices, commercial paper, vouchers, etc.

CORRESPONDENCE.—Practice in writing business letters, orders, and telegrams.

PENMANSHIP.

PUBLIC SPEAKING.—One hour a week, for young men.

PHYSICAL TRAINING in the Gymnasium, twice a week.

Table of the distribution of time for the several subjects of instruction:

Subject	No. of hours per week
Stenography	9
Typewriting	5
English	2
Accounts, Business Forms and Customs	1
Correspondence	1
Penmanship	1
Physical Training	2
Total	21

CERTIFICATES

Certificates are granted to students who complete

any one of the Office Courses and pass the prescribed examinations.

GYMNASIUM

The Gymnasium is a large, airy room, completely equipped in accordance with the requirements of the Swedish system of physical training and with dressing-rooms, and bath-rooms supplied with hot and cold water. All the training is conducted under the immediate supervision of the Directors.

COMMERCIAL MUSEUM

A beginning was made in 1895 toward the formation of a permanent Commercial Museum, and a large collection of raw and manufactured products has been secured. The collection represents quite fully the following industrial products: Flour; wool; petroleum; teas and coffees; sugar; cotton; copper; iron and steel; glass; tobacco; leather; rubber; paper; wood; carpet; linen; spices; aluminum; building stone; brick and terra-cotta. Additions are constantly being made, and the student who is looking forward to devoting his life to trade, shipping, or manufacturing, has opportunity, in connection with his academic work, to make a special study, from both a geographic and an economic standpoint, of the particular industry in which he is interested.

ART MUSEUM

The Art Museum contains extensive collections representing the industrial arts of Egypt, India, China, Japan, and Europe.

LIBRARY

The Library, which contains thirty-one thousand volumes, is supplied with books, periodicals, and pamphlets bearing upon the work of the department, and every facility and assistance is afforded for the study of financial, economic, and commercial questions.

ADMISSION

Applicants for admission to any of the courses, except the Commercial Course for Teachers, must pass satisfactory examinations in English Grammar and Composition, Geography, Arithmetic, and United States History.

For admission to the School of Commerce and Accounts, or to any of the Office Courses, candidates must be at least sixteen years of age.

The diploma of high schools of approved standing is accepted in place of an examination.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEEES AND TERMS

School of Commerce and Accounts, *twenty-five dollars* per term.

Commercial Course for Teachers, *thirty dollars* per term.

Office Courses, *twenty-five dollars* per term, each.

Students provide their own text-books and stationery.

Coat-lockers, with individual combination locks, are

provided for the men students, giving to each the absolute control of his own property. Each student is charged *fifty cents* per term for a locker.

A deposit of *one dollar* is required of each student for necessary keys. This deposit is refunded at the end of the year, on return of the keys.

There are two terms in the year, beginning, respectively, in September and February. New classes are formed only in September. Five days' attendance a week, from 9 a. m. until 3 p. m., is required for all courses.

EVENING COURSES

The Department of Evening Classes is fully organized, and includes the following courses in commercial instruction:

1. A Systematic Course in Bookkeeping, Commercial Arithmetic, and Penmanship.
2. Office Course in Stenography and Typewriting.

Full details will be found on page 255.

DEPARTMENT OF DOMESTIC SCIENCE

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

HELEN M. SPRING,
Director.

ALBERT P. BRUBAKER, M. D.,
Professor of Anatomy and Physiology.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

HARRIET L. MASON,
Professor of English Language and Literature.

ABRAHAM HENWOOD, B. S.,
Assistant Professor of Chemistry.

PROFESSOR HOMER J. HOTCHKISS, A. M., M. M. E.,
Lecturer on Heat.

PROFESSOR ARTHUR J. ROWLAND,
Lecturer on Electricity.

PROFESSOR ARTHUR TRUSCOTT,
Lecturer on Domestic Architecture.

ALICE M. BRENNAN,
Instructor in Vocal Expression.

JOHN T. HOLDSWORTH, Ph. B.,
Lecturer on Business Customs and Accounts.

MARGARET C. LIMERICK,
Instructor in Household Economics.

HARRIET P. MITCHELL,
Instructor in Bacteriology and Household Economics.

KATHARINE MC COLLIN,
Instructor in Cookery.

EMMA SMEDLEY,
Instructor in Household Economics.

MAUDE G. HOPKINS,

Director of Physical Training.

PRESIDENT MAC ALISTER lectures on The History and Institutes of Education, during the Senior Year.

COURSES IN HOUSEHOLD ECONOMICS

The following courses are offered:

- I. GENERAL COOKERY—three successive Courses.
- II. COURSE IN INVALID COOKERY.
- III. SERVING COURSE.
- IV. LAUNDRY COURSE—two successive Courses.
- V. HOME NURSING.
- VI. HOUSEKEEPERS COURSE IN DOMESTIC SCIENCE.
- VII. NORMAL COURSE IN DOMESTIC SCIENCE.
- VIII. The following lectures are given in connection with several of the courses enumerated above. They may be taken by persons not enrolled in any of the preceding courses.
 1. Lectures on Personal Hygiene and Emergencies.
 2. Lectures on Domestic Sanitation.
 3. Lectures on Domestic Architecture.
 4. Lectures on Heat and Electricity in their Relation to the House.
- IX. Evening Classes embracing the following courses: First and Second Courses in Cookery, Course in Invalid Cookery, Serving Course.

I. GENERAL COOKERY

There are three courses in General Cookery. Each course occupies one term and is complete in itself. The three courses are consecutive and must be taken up in regular order.

FIRST COURSE.—Instruction in the composition and dietetic value of food materials. The lessons are arranged in logical order, and each principle is illustrated by the preparation of simple dishes. The instruction is largely individual, each student preparing an entire dish. The object of the course is the preparation of food in the most digestible and appetizing forms.

SECOND COURSE.—Instruction and practice of an advanced character, in the preparation of more complicated dishes than are included in the First Course.

THIRD COURSE.—This course includes the preparation of still more elaborate and expensive dishes; lessons on marketing and carving; practical demonstration in the cutting of meat.

These courses present the scientific, hygienic, and sanitary features of the household in such a manner as will prove of practical benefit to women who manage their own homes. It supplies the kind of knowledge needed by young women preparing themselves for household duties and responsibilities.

In each course, one lesson, of three hours, is given weekly.

II. INVALID COOKERY

The course is intended for professional nurses and other persons desirous of acquiring a practical knowledge of cookery suitable for the sick-room. The course extends through one term, with one lesson, of two and one-half hours, each week. A carefully prepared syllabus is made the basis of the instruction.

Classes of medical students desirous of taking the course can receive instruction in the afternoon or evening.

III. SERVING COURSE

The course includes the care of the dining-room and pantry; care of silver and cutlery; care of lamps; serving of breakfast, luncheon, and dinner; washing dishes; preparation of salads and sandwiches. The course comprises eight lessons, of two hours each.

IV. COURSES IN LAUNDRY WORK

Two courses, each of which consists of eight lessons. Instruction is given in the scientific principles of laundry work, as well as in actual washing and ironing. Each lesson occupies two hours.

V. COURSE IN HOME NURSING

This course includes eight lessons, on the following topics: furnishing, warming, and ventilating of the sick-room; bathing, dressing, and administering food and medicine to patients; practical bandaging; bed-making; lifting and caring for helpless patients;

preparation and application of poultices. The training is carried on in a furnished bedroom. Each lesson occupies one hour.

VI. HOUSEKEEPERS COURSE

This course is offered in the belief that greater skill and intelligence are needed in the management of the home, and for the purpose of providing thorough training for women possessing the requisite qualifications to fit themselves for positions as housekeepers or as matrons of public institutions. The course occupies one year. It embraces the following subjects:

FIRST TERM	No. of hours per week	SECOND TERM	No. of hours per week
Cookery	9	Cookery	9
Serving Course	2	Home Nursing (8 weeks) ..	1
Laundry	2	Domestic Architecture ..	1
Marketing	—	Dietaries	2
Anatomy and Physiology ..	2	Anatomy and Physiology ..	2
English	1	Business Customs and	
Business Customs and		Accounts	1
Accounts	1	Physical Training	2
Physical Training	2		
	19		18

With additional lectures and practical work.

CERTIFICATE

A certificate is given to students who complete the course.

VII. NORMAL COURSE IN DOMESTIC SCIENCE

The Normal Course in Domestic Science is designed for persons who wish to become directors or instructors

in this department of educational work in public or private schools, colleges, or hospitals. The course of instruction and training is comprehensive and liberal. The importance of domestic science in its economic and social relations is daily becoming more fully recognized, and the demand for teachers possessing the requisite qualifications is constantly increasing. The instruction is thoroughly scientific and practical, and its bearings upon domestic life are kept in view throughout the course.

The course occupies two years. Students attend five days a week.

The following tables give the subjects of instruction and the distribution of time for the same:

JUNIOR YEAR

FIRST TERM

SUBJECT	No. of hours per week
Theory and Practice of Cookery	7
Serving and Practice Teaching of Serving	2
Laundry	2
Business Customs and Accounts	1
English Language	1
Anatomy and Physiology	2
Chemistry	5
Observation of Cookery Class	2 ¹
Physical Training	2
Heat and Electricity	1 ¹
	25

¹ Half term.

SECOND TERM

SUBJECT	No. of hours per week
Theory and Practice of Cookery	7
Business Customs and Accounts	1
Lectures on Commerce and Economics	1 ¹
English Language and Literature	1
Anatomy and Physiology, including Personal Hygiene and Emergencies	2
Chemistry	5
Domestic Architecture	1 ¹
History of Education	1 ¹
Practice Teaching ²	2
Observation and Criticism of Practice Teaching	2
Vocal Expression—Voice Training and Reading	—
Physical Training	2
	25

¹ Half term.² More than 2 hours may be given to this subject.

SENIOR YEAR

FIRST TERM

SUBJECT	No. of hours per week
Cookery	6
Bacteriology	5
Chemistry	9
Physiology	2
Physical Training	2
Practice Teaching	—
	24

¹ The Practice Teaching adds several hours to the program.

SECOND TERM

SUBJECT	No. of hours per week
Cookery	8
Dietaries	2
Home Nursing	1 ¹
Physiology, including Domestic Sanitation	2
Chemistry	9
Physical Training	2
Practice Teaching	— ²
	24

¹ Half term.² The Practice Teaching adds several hours to the program.

DIPLOMA

A diploma is given to students who finish the course.

SUBJECTS OF INSTRUCTION

HOUSEHOLD SCIENCE AND ECONOMICS

Lectures on the various subjects related to the economics of the house. These include: Classification of food principles; water; salts; carbohydrates; fats; proteids; food adjuncts; baking-powders; fermentation; the preservation of food materials; national and state laws regarding the adulteration of food and the inspection of meat; manufactured food materials; scientific kitchens (public kitchens, school kitchens, and home kitchens); care of the house according to hygienic laws; disposal of waste.

GENERAL COOKERY.

First Course.—Instruction in the composition and dietetic value of food materials. The lessons are arranged in logical order, and each principle is illustrated by the preparation of simple dishes. The object of the course is the preparation of food in the most digestible and appetizing forms.

Second Course.—Instruction and practice of an advanced character, in the preparation of more complicated dishes than are included in the First Course.

Third Course.—The preparation of still more elaborate and expensive dishes; lessons in marketing and carving; practical demonstration in the cutting of meat.

INSTITUTION COOKERY.—Larger amounts of material are used than in the above courses, and the practical and economic problems involved in providing for large numbers are studied.

Each of the courses named above consists of sixteen lessons of three hours each.

INVALID COOKERY.—This course includes the preparation of food suitable for the patient, and is the same as that given to professional nurses. There are sixteen lessons of two and one-half hours each.

SERVING COURSE.—The course includes the care of the dining-room and pantry; care of silver and cutlery; care of lamps; serving of breakfast, luncheon, and dinner; washing dishes; preparation of salads and sandwiches. The course comprises eight lessons of two hours each.

LAUNDRY WORK.—Two courses, each of which consists of eight lessons. Instruction is given in the scientific principles of laundry work, as well as in actual washing and ironing. Each lesson occupies two hours.

HOME NURSING COURSE.—This course includes eight lessons on the furnishing, warming, and ventilating of the sick-room; bathing, dressing, and administering food and medicine to patients; practical bandaging; bed-making, lifting and caring for helpless patients; preparation and application of poultices. Each lesson occupies one hour.

CHEMISTRY

The study of Chemistry is begun in the Junior Year with a general course giving a full exposition of the principles of the science and including the study of the most important elements and their chief compounds. In the Second Term, a qualitative study of the Proximate Food Principles and a practical examination of the more important food materials are undertaken. There are two lectures a week, and one laboratory period of three hours.

In the Senior Year (First Term), Organic Chemistry is taken up, one lecture a week being given, with one laboratory period in which the student prepares and studies a typical compound of each class. During the Second Term, a course of lectures in the chemistry of foods and dietetics is given, the lectures being supplemented by laboratory work. The lectures cover the following topics: Definitions of foods—chemical composition of food materials and of the human body; proximate food principles—protein, fat, carbohydrates, water, mineral matter; value of foods; use of calories; nutrient ratio; metabolism of foods; diet and dietaries; food materials—water (potable and mineral), common salt, starch foods, sugars, fats and oils, cereals, meats, eggs, fish, fruits, vegetables, salads, beverages, food adjuncts; study of fermentation; preparation of food materials; changes that foods undergo in cooking processes.

The Course in Quantitative Analysis, which deals with foods and dietetics, is given in the Second Term of the Senior Year. Practical laboratory experience with the processes in present use for the analysis of food materials is made the basis of the instruction. The laboratory work is of such a character as to furnish data for the calculation of food values as well as to detect adulterations. The following list indicates the general scope of the quantitative work: Chemically pure salts; potable water; common salt; bicarbonate of sodium; flour or bread; baking-powders; sugar or syrups; milk; butter; lard; cheese; tea; coffee; chocolate.

Printed syllabuses are made the basis of the work in chemistry during the Senior Year.

ANATOMY AND PHYSIOLOGY

During the Junior Year, the course of instruction embraces both lectures and demonstrations. The lectures cover the following topics: The general plan of organization of the animal body; the physical and chemical properties of the tissues; the chemical composition and physiological properties of foods and their relative values as nutritive agents; the general process of digestion; the elaboration of food into blood; the circulation of the blood, respiration, animal heat; secretion and excretion; the physiology of the nervous system and special senses with reference to the lectures on psychology. The laboratory demonstrations have reference to the above course of lectures.

PERSONAL HYGIENE. EMERGENCIES

The lectures on Personal Hygiene include: Physical and physiological development; the educational value of physical training; clothing; the relation of foods to disease; the care of the alimentary canal; the care of the skin; and similar hygienic topics. The lectures on Emergencies embrace the following subjects: Convulsional seizures; hemorrhages, burns, and scalds; the more common poisons and their antidotes; the treatment of minor wounds, sprains, and injuries; bandaging.

During the Senior Year, the laboratory work includes the following topics: The chemical relation of starch, sugar, fat, and proteids; the determination of the heat values of food; the process of fermentation; the cultivation of micro-organisms and their relation to disease; dissections of different animal forms generally used as foods. The lectures embrace the following topics: Ptomaines and leucomaines of foods and their influence in the production of disease; the parasites usually associated with animal foods; diseases of nutrition, such as gout, diabetes, rickets, scurvy, and rheumatism.

DOMESTIC SANITATION

The lectures include the following topics:

House Location.—Character of soil; ground water; ground air; drains; cellar-walls; care of cellar.

Water Supply of Villages.—Wells, cisterns, springs; sources of infection. Construction of wells and cisterns for filtration and storage of water.

Water Supply of Cities.—Surface or river water; sources of infection; methods of purification.

Plumbing Appliances.—1. For the introduction of water. 2. For the removal of sewage.

Ventilation.—Atmospheric vitiation due to breathing, to gases from soil, furnaces, etc. Methods of ventilation. The disinfection of the house during and after contagious diseases.

DOMESTIC ARCHITECTURE

A course of lectures on the following subjects:

First Lecture.—The location, considered artistically and hygieni-

cally. The placing of the house. Drawing of site. Opportunities of situation. Calculation as to the investment. Materials of construction, in relation to cost—to style. Approximate cost and methods of figuring.

Second Lecture.—The house in detail. The planning of the house as influenced by the character of the exterior. The rooms and their position in the house. Vistas. The basement; first floor; second floor; attic. Planning in general.

Third Lecture.—Materials. Qualities and characteristics of materials—stone, brick, concrete, cements, wood, etc., used in the construction of the building proper.

Fourth Lecture.—Materials. Qualities and characteristics of materials used for the finishing and beautifying of the house. Relative cost of materials. Maintenance.

Fifth Lecture.—Sanitation. The hygiene of the house—lighting, water supply, drainage, heating, ventilation.

Sixth Lecture.—A discussion of architectural styles.

Seventh Lecture.—The surroundings of the house. The beautifying of the grounds. Landscape gardening and landscape architecture.

HEAT AND ELECTRICITY

Nature of heat; thermometers and the measurement of temperature. Expansion of solids, liquids, and gases. Measurement of heat; heat of fusion and vaporization. Transmission of heat; conduction, convection, and radiation. Practical application in heating houses; control of heat; useful instruments. Some causes affecting the temperature and condition of the atmosphere. Some principles relating to the use of electric current for household purposes. Electric heating and heating apparatus, and the economic principles connected with their use.

BACTERIOLOGY AND MICRO-ORGANISMS OF FERMENTATION

The subject of bacteriology is dealt with chiefly in its normal and sanitary relations. The course includes: the examination of air, water, ice, and milk; the principles of sand filtration, and the testing of the efficiency of filters; the preparation of culture media and the determination of species; sterilization, disinfectants, and anti-septics. The fermentation organisms studied are those met with in vinegar-making, bread-making, and dairying.

ENGLISH LANGUAGE AND LITERATURE

JUNIOR YEAR.—*First Term:* Choice of words, phraseology, synonyms, letter-writing, punctuation. *Second Term:* The paragraph, principles of style, composition, plan-making.

SENIOR YEAR.—*First Term:* The isolated paragraph, development by defective method; combination of paragraphs: ordering of material; scale of treatment. This work gives constant practice in offhand writing.

VOCAL EXPRESSION

Enunciation, pronunciation, emphasis, word pictures, atmosphere, tone color, rhythm, movement.

BUSINESS CUSTOMS AND ACCOUNTS

A practical course in single-entry bookkeeping, involving the use of day-book, ledger, cash-book, bill-book, etc. Students are required to make out bills and receipts, to use check-books and pass-books, and to make deposits in the bank, using the proper forms. This practical work is supplemented with lectures on business customs, notes, drafts, letters of credit, and banking.

LECTURES ON COMMERCE AND ECONOMICS

Historical sketch of commercial development.

Natural Resources.—Mineral; animal—provision trade; vegetable.

Transportation.—Railways—warehousing. Storage—refrigeration. Markets—domestic and foreign. Import trade.

Aids and Hindrances to Trade.—Tariff—Department of Commerce and Labor. Consular service—reciprocity.

Public Finance.—Receipts—import duties, internal revenue. Expenditures—public debt.

Survey of other great commercial nations.

A visit is made to the Commercial Museum of Philadelphia.

OBSERVATION OF CLASSES IN PUBLIC SCHOOL KITCHENS.

PRACTICE CLASS TEACHING. DEMONSTRATIONS

Opportunities for both observation and teaching are given to the students. During the Senior Year, students who do satisfactory

work in teaching are allowed to accept paid classes. In the Senior Year of the course, students also give practice demonstrations in cookery.

HISTORY AND INSTITUTES OF EDUCATION

During the Second Term of the Junior Year, a course of lectures is given by the President of the Institute in The History of Theories of Education, attention being concentrated upon the progress of education during the past three hundred years. The practical organization and management of school work is also fully discussed, and the special relations of technical and industrial training to general education are carefully elaborated.

PHYSICAL TRAINING

Students taking this course must attend the Institute classes in Physical Training twice a week. The close connection between bodily training and the instruction in physiology and hygiene is kept in view throughout the entire course.

ADMISSION

Application for admission to any of the courses must be approved by the Director of the Department.

For admission to the Normal Course in Domestic Science, at least a high-school education or its equivalent is required. The diploma of approved institutions is accepted in lieu of an examination. The number of students that can be received is limited.

Applicants for admission to the Housekeepers Course must have a good general education and be at least twenty-five years of age.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

The fees for the several courses, per term, including materials, are as follows:

First Course in General Cookery, *ten dollars*.

Second Course in General Cookery, *fifteen dollars*.

Third Course in General Cookery, *sixteen dollars*.

Invalid Cookery, *ten dollars*. Classes of Nurses from Hospitals and of Medical Students, *six dollars*.

Serving Course, *three dollars*.

First Course in Laundry Work, *three dollars*.

Second Course in Laundry Work, *three dollars*.

Home Nursing Course, *three dollars*.

Housekeepers Course, *twenty-five dollars*.

Normal Course, *forty dollars* per term.

Lectures on Personal Hygiene and Emergencies, *five dollars*.

Lectures on Domestic Sanitation, *five dollars*.

Lectures on Domestic Architecture, *three dollars*.

Lectures on Heat and Electricity, *three dollars*.

A deposit of *five dollars*, to cover breakage in the Chemical Laboratories, is required of each student in the Normal Course. This is returned at the close of the term, less the cost of the apparatus destroyed.

Students supply their own text-books and stationery.

There are two terms in the year, beginning, respectively, in September and February.

EQUIPMENT

The appointments and equipment for the various branches of instruction are unsurpassed. The Chemical and Biological Laboratories are supplied with the newest and most approved forms of apparatus. There are three large school-kitchens furnished with every convenience, and intended to serve as models in all their sanitary arrangements. The Laundry is a large, finely appointed room, with all the most recent appliances for every form of laundry work. Everything necessary for the scientific instruction, as well as for the practical training, of the students is provided.

GYMNASIUM

The Gymnasium is a well-lighted and well-ventilated hall. In connection with the Gymnasium, there are suites of dressing-rooms, and finely appointed marble baths with hot and cold water.

LIBRARY

The Library, which contains thirty-one thousand volumes, is supplied with an extensive collection of books, and the Reading-room with the best periodicals, relating to the subjects taught in the course.

EVENING CLASSES

In the Evening Classes, instruction is given in the first two courses of General Cookery, in the Serving

Course, and in Invalid Cookery, and is similar to that of the day classes.

The session extends through six months, from the beginning of October to the end of March. In each course, one lesson, of two hours, is given weekly.

Fees for the entire session, which include the cost of all the materials used in the instruction: First Course, *five dollars*; Second Course, *six dollars*; Invalid Cookery, *six dollars*; Serving Course, *three dollars*.

Full details will be found on page 263.

PREPARATORY COURSE FOR NURSES TRAINING SCHOOLS

The rapid development in this country of training schools for nurses has led of late to serious discussion as to the kind and amount of scientific education which should be given to the nurses in training. The question has been before the American Society of Superintendents of Training Schools for Nurses, and the drift of opinion is evidently in favor of increasing the amount and raising the standard of the instruction given in those studies which might be characterized as auxiliary to the strictly professional training given in the hospitals. The conviction among persons who have given the matter special attention seems to be that this scientific knowledge could be more advantageously acquired if given independently of the professional work; and the general conclusion which has been reached is that if a preparatory course of training in the scientific branches, a knowledge of which is essential to a fully equipped nurse, should be provided, relief from the pressure upon the women in the first year of the Training Schools would be obtained, while the standard for the education of nurses would be raised along the whole line.

At the solicitation of Dr. S. Weir Mitchell and the Superintendents of the leading Nurses Training Schools in Philadelphia, the Drexel Institute has organized such

a Preparatory Course of Instruction. The necessary facilities of the Institute for carrying on this work, in the way of laboratories, lecture-rooms, classrooms, school-kitchens, apparatus and appliances, are unsurpassed.

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

ALBERT P. BRUBAKER, M. D., in charge,
Professor of Anatomy and Physiology.

ERNEST A. CONGDON, PH. B.,
Professor of Chemistry.

ABRAHAM HENWOOD, B. S.,
Assistant Professor of Chemistry.

EDWARD Q. THORNTON, M. D.,
Lecturer on Materia Medica.

HELEN M. SPRING,
Director of the Courses in Domestic Science
and Economics.

MARGARET C. LIMERICK,
Instructor in Cookery.

HARRIET P. MITCHELL,
Instructor in Bacteriology.

HARRIET L. MASON,
Professor of English Language and Literature.

ALICE M. BRENNAN,
Instructor in Vocal Expression.

MAUDE G. HOPKINS,
Director of the Gymnasium.

COURSE OF INSTRUCTION

FIRST TERM

ANATOMY AND PHYSIOLOGY.—Lectures and demonstrations.

CHEMISTRY.—Lectures and laboratory work.

MATERIA MEDICA.—Lectures and recitations.

DOMESTIC SCIENCE AND ECONOMICS.

ENGLISH LANGUAGE.—The construction and use of the sentence; paragraphing; correspondence.

VOCAL EXPRESSION.—Voice training and reading.

PHYSICAL TRAINING in the Gymnasium.

SECOND TERM

ANATOMY AND PHYSIOLOGY.—Lectures and demonstrations.

CHEMISTRY.—Lectures and laboratory work.

HYGIENE.—Personal and domestic.

BACTERIOLOGY.—Lectures and laboratory work.

DOMESTIC SCIENCE AND ECONOMICS.

ENGLISH LANGUAGE.—The writing of statements, synopses, reports, etc.

PHYSICAL TRAINING in the Gymnasium.

Occasional lectures on special topics are given by representative physicians throughout the year.

The attendance of students is required from 9 a. m. until 3 or 4 p. m., with an intermission of one hour at noon.

The public lectures on art, science, literature, etc., and the public concerts, which are given at the Insti-

tute during the winter months, are free to the students, and afford liberal opportunities for general culture to those who care to make use of them. The same may be said of the Library, the Museum, and the Picture Gallery.

CERTIFICATE

A certificate is given to students who complete the full course and pass all the required examinations.

The leading Training Schools in Philadelphia give the preference for admission to candidates who hold the certificate of the Preparatory Course. The certificate of the Drexel Institute will be accepted by them without an examination.

Persons holding the certificate of the Drexel Institute Preparatory Course for Nurses Training Schools are given one-half year's credit in the full course of the Training School for Nurses, Pennsylvania Hospital.

ADMISSION

Applicants must be not less than twenty years of age, and must have had at least a high-school education or its equivalent. When the diploma or certificate of a school of approved standing is not presented, the Faculty must be satisfied as to the general intelligence and educational attainments of the candidate. Students are admitted only at the beginning of the academic year.

Applicants for admission to the Preparatory Course should be sure that they will be able to meet all the

requirements for admission to the Training Schools for Nurses. The following, from the circular of one of the leading Training Schools, may be taken as a statement of the conditions that are required generally throughout the country :

The work of nursing demands intelligence, good temper, thorough trustworthiness, and a cheerful and willing disposition. It is essential that the candidate should be of unblemished character and in sound health of body and mind.

Application for admission should be made to the Registrar, at the Institute.

The Course offers special advantages to graduates of Nurses Schools who are desirous of adding to their scientific knowledge and training.

The Course is open also to women not intending to become nurses, but who wish to avail themselves of the instruction and training which it offers.

FEES AND TERMS

Fee, *thirty dollars* per term.

There are two terms in the year, beginning, respectively, in October and February.

Board and lodging can be obtained in Philadelphia for five dollars per week, upwards.

Text-books and stationery cost about ten dollars for the year.

SUBJECTS OF INSTRUCTION

ANATOMY AND PHYSIOLOGY

The course of instruction embraces both lectures and demonstrations. The lectures cover the following topics: The general anatomy and physiology of the human body; the physical and chemical properties of the tissues; the chemical composition and physiological properties of foods and their relative values as nutritive agents; the process of digestion; the elaboration of food into blood; the circulation of the blood; respiration; animal heat; secretion and excretion; the physiology of the nervous system and special senses; the larynx and the voice.

CHEMISTRY

Laboratory manipulation. Fundamental principles and laws of the science of Chemistry. Chemical study of the atmosphere. Chemical study of water. The elementary gases: oxygen, hydrogen, and nitrogen. Compounds of these elements with one another: ammonia, nitric acid. Acids, bases, and salts; chemical nomenclature; neutralization. Study of the element carbon—carbon monoxide and dioxide. Hydrogen compounds. Fermentation—chemistry of bread-making, baking-powders. Combustion. Fuels: solid, liquid, and gaseous. Chemical study of common food materials. The proximate food principles: non-nutrients—water, mineral matters (inorganic); nutrients—fats, carbohydrates, protein. Food values—use of the calorie. Chemical study of typical food stuffs: milk, eggs, flesh, cereals. Adulterations of food materials and their detection.

MATERIA MEDICA

Forms under which medicines are administered; routes of entrance into the body; absorption; elimination; measures and symbols; nature and properties of frequently used drugs; anesthetics; antiseptics and disinfectants; emetics, cathartics; topical remedies.

HYGIENE

The course in hygiene is of a thoroughly practical nature, including the care of the body, the organization and care of the house, heating and ventilation, water-supply and drainage, plumbing, lighting, sanitation of dwellings and hospitals. Two hours a week are given to physical training in the Gymnasium.

BACTERIOLOGY

The subject of bacteriology is dealt with chiefly in its normal and sanitary relations. The course includes the examination of air, water, ice, and milk; the principles of sand filtration and the testing of the efficiency of filters; the preparation of culture media and the determination of species; sterilization, disinfectants, and antiseptics.

DOMESTIC SCIENCE AND ECONOMICS

The instruction in Domestic Science includes the following courses: 1. Instruction in the composition and dietetic value of food materials. The lessons are arranged in logical order, and each principle is illustrated by the preparation of simple dishes. The object of the course is the preparation of food in the most digestible and appetizing forms. 2. The preparation of more complicated dishes than are included in the first course. Lessons in marketing and carving, and practical demonstration in the cutting of meats. 3. Invalid cookery, including the preparation of food suitable for the sick-room.

EQUIPMENT

The scientific equipment of the Institute, as to laboratories, school-kitchens and classrooms, is unsurpassed. Everything necessary for the scientific instruction, as well as for the practical training of the students is provided.

GYMNASIUM

The Gymnasium is a large, airy room, completely equipped in accordance with the requirements of the Swedish system of physical training, and with dressing-rooms and bath-rooms supplied with hot and cold water. All the training is conducted under the immediate supervision of the Director.

LIBRARY

The Library, which contains thirty-one thousand volumes, is well supplied with books bearing upon the special work of the Course.

MUSEUM AND PICTURE GALLERY

The Museum contains extensive collections representing the arts of Egypt, India, China, Japan, and Europe. The Picture Gallery contains The John D. Lankenau Collection and The Anthony J. Drexel Collection of paintings, in which are found examples of work by the leading artists of the German, Italian, French, Spanish, and other schools.

DEPARTMENT OF DOMESTIC ARTS

COURSES IN DRESSMAKING

INSTRUCTORS

- CAROLINE A. M. HALL, Director,
Instructor in the Theory and Practice of Dressmaking.
- MARY L. SARGENT,
Instructor in Dressmaking.
- MARY E. EASTWOOD,
Instructor in Dressmaking.
- JENNIE COLLINGWOOD,
Instructor in Dressmaking.
- MARY HENLEIGH BROWN,
Instructor in Sewing and Dressmaking.
- LAURA E. WAGNER,
Instructor in Dressmaking.
- HÉLÈNE ZOGBAUM,
Instructor in Design in Dressmaking.
- PROFESSOR ERNEST A. CONGDON, Ph. B.,
Lecturer on the Chemistry of Textiles, Dyeing, and
Cleansing.
- PROFESSOR JOHN T. HOLDSWORTH,
Lecturer on Business Customs and Accounts.
- MAUDE G. HOPKINS,
Director of Physical Training.

COURSES OF INSTRUCTION

The following courses in Dressmaking are offered:

- I. GENERAL COURSE.
- II. TECHNICAL COURSE.
- III. COSTUME DESIGNING.
- IV. COURSE IN SEWING.
- V. EVENING CLASSES.

I. GENERAL COURSE

The General Course of Instruction consists of four grades, each occupying one term, or half the academic year. The four consecutive grades are essential to thorough training in the practice of the art.

All materials, except those supplied in the Third and Fourth Grades for ordered work, must be furnished by the students.

All work cut and planned in the classroom must be finished at home.

FIRST GRADE

This grade is devoted to the fundamental principles of dressmaking. One plain dress is completed. Two lessons, of two hours each, are given weekly.

SUBJECTS OF INSTRUCTION

- I. Implements and appliances used in dressmaking.
- II. Cotton staple, its various uses; choice of materials; textiles as to color and application to dress.
- III. Taking measurements; drafting foundation skirt; drafting draperies, and principles of same; finishing skirt for trimming or draping; making lined skirt.
- IV. Form, proportion, and line relating to ornament in dress.
- V. Plans for completing skirts; cutting waists with seams from patterns drafted by students of the advanced grades, from measurements taken from different members of the class; basting, fitting; planning trimming; general finish.
- VI. Drawing—outline and light and shade.

SECOND GRADE

In this grade, attention is paid to taking measurements of different figures and to drafting patterns from

the same. The first dress made is of plain material; the second is a waist or entire garment of striped or plaid material; the third, a garment on the gown-form. Two lessons, of two hours each, are given weekly.

Instruction is provided also in accounts, business forms, and correspondence, two lessons, of one hour each, being given weekly during this term.

SUBJECTS OF INSTRUCTION

- I. Color and textiles; their various uses and relations to personal adornment; growth of wool and silk; manufacture of fabrics.
- II. Taking measurements; drafting plain waist from different measurements; drafting waist with extra seams for large figure; cutting and matching striped, plaid, or figured material for waist—making and trimming the same; drafting and making dresses on the gown-form.
- III. Artistic dress in its relation to the body; design in drapery.
- IV. Making dress on gown-form from the student's own design.
- V. Drawing—proportions of the human figure; draperies and gowns in black and white and in color; color values.

THIRD GRADE

The work of this grade is chiefly an extension of that of the two preceding grades, with the additional subjects of instruction named below. For further practice, students may receive and execute orders. Two lessons, of two hours each, are given weekly.

SUBJECTS OF INSTRUCTION

- I. Advanced drafting. Choice of materials for gowns of special character.
- II. Making dinner dress, evening dress; choice of materials for the same. Handling of velvet.
- III. Making models of inexpensive materials to test the design.

- IV. The form and poise of the body in their relation to dress.
- V. Child's dress—materials, drafting, cutting, and making the same.
- VI. Drawing—rendering of dresses in black and white; design and ornament; lace and passementerie; textiles.

FOURTH GRADE

This grade completes the General Course. It includes instruction in tailor finish, as applied to dresses, jackets, and coats. Orders may be received and executed by students. Two lessons, of two hours each, are given weekly.

SUBJECTS OF INSTRUCTION

- I. Materials used in making coats, as staple and manufactured.
- II. Drafting jackets and coats of various styles; cutting, basting, fitting, pressing; practice in making pockets, applying same to garments; making buttonholes, sewing on buttons; lining and finish of coat; making collars.
- III. Principles applied to tailor-made dresses.
- IV. Drawing—designing of costumes in color and monochrome.

A course of lectures in the chemistry of textiles, dyeing, and cleansing is given during the second term of each year.

II. TECHNICAL COURSE

This course is arranged to meet the needs of those who wish to become professional dressmakers. The course extends through one year and comprises all the work of the General Course. It provides additional practice in executing orders, which students may take on their own account during the second half of the year.

Four hours daily, except on Saturday, are given to dressmaking. Additional time is required for the other branches.

Students receive the full course of instruction in drawing and water-color, and in the keeping of accounts, business forms, and correspondence, given in the General Course.

The students of this course have the privilege of physical training in the Gymnasium without the payment of an additional fee.

For admission, each applicant must be at least eighteen years of age, and have a good knowledge of hand and machine sewing, and must present for inspection a lined dress made by herself from patterns.

Applicants are admitted to this course only in September of each year, and for the entire course.

III. COSTUME DESIGNING

This course is intended for students desiring to specialize as illustrators and designers of costume. The full course of instruction includes elementary drawing from the cast, sketching from the draped figure, still life, free-hand perspective, water-color, and elementary composition. Ample use is made of the extensive collection of books on costume in the Library and of the textiles in the Museum.

The full course occupies two years.

CERTIFICATES

A certificate is granted to students who satisfactorily complete the four grades of the General Course. A certificate is given also to students who complete

the Technical Course and pass all the required examinations.

IV. COURSE IN HAND AND MACHINE SEWING

The Course in Sewing includes the simple stitches used in hand and machine sewing and their application in the making of garments. Work cut and planned in the classroom must be completed at home. All materials are supplied by the student.

Students who have not had the necessary preliminary training or experience in hand and machine sewing are expected to take this course, in whole or in part, before beginning the dressmaking work.

The course occupies three terms. Two lessons, of two hours each, are given weekly.

Students who can meet the requirements of the preceding grades will be admitted to advanced standing.

Applicants must have a good elementary education.

SUBJECTS OF INSTRUCTION

First Grade.—History of implements used in hand sewing; kinds and qualities of materials for undergarments; proper position of the body in sewing; methods of using thread and needles, thimble, and tape-measure; woven textiles; different kinds of stitches; combination of stitches; seams, hems, tucks; buttonholes; making simple garments.

Second Grade.—Sewing machines; measurements; drafting and making undergarments of different designs.

Third Grade.—Drafting, cutting; making shirt-waists, cotton dresses, and garments for infants; embroidery for marking linen; drawn and cut work; fancy stocks.

SHIRT-WAIST COURSE.

This course, which occupies one term, has been arranged to meet the increasing demand for instruction in the making of shirt-waist suits and gowns of dainty and washable materials. For admission, the applicant must pass an examination in hand and machine sewing.

ADMISSION

For admission to the courses in Dressmaking, applicants must be at least eighteen years of age and must be able to do hand and machine sewing. Applicants for admission are examined at the beginning of each term.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

GENERAL COURSE

First Grade, *fifteen dollars* per term.

Second Grade, *twenty dollars* per term, including the price of the drafting chart.

Third Grade, *twenty dollars* per term.

Fourth Grade, *twenty dollars* per term.

TECHNICAL COURSE.—*Thirty dollars* per term.

COSTUME DESIGNING.—*Twenty-five dollars* per term.

SEWING COURSE.—*Twelve dollars* per term.

SHIRT-WAIST COURSE.—*Fifteen dollars*.

There are two terms in the year, beginning, respectively, in September and February. In the General Course, students enter for one term at a time.

EVENING CLASSES

In the Evening Classes, instruction is given in the First, Second, and Third Grades of the General Course in Dressmaking. Each grade occupies one session. There are also classes in Sewing and a Shirt-Waist Course.

The session extends through six months, from the beginning of October to the end of March.

In each grade, two lessons, of two hours each, are given weekly.

Full details will be found on page 259.

COURSES IN MILLINERY

INSTRUCTORS

- EMILY G. SWETT, Director,
Instructor in the Theory and Practice of Millinery.
- CORA FOX,
Instructor in Millinery.
- SOPHIA GLOECKNER,
Instructor in Millinery.
- HÉLÈNE ZOGBAUM,
Instructor in Design in Millinery.
- PROFESSOR JOHN T. HOLDSWORTH,
Lecturer on Business Customs and Accounts.
- PROFESSOR ERNEST A. CONGDON, Ph. B.,
Lecturer on the Chemistry of Textiles, Dyeing, and
Cleansing.
- MAUDE G. HOPKINS,
Director of Physical Training.

COURSES OF INSTRUCTION

The following courses in Millinery are offered:

- I. GENERAL COURSE.
- II. TECHNICAL COURSE.
- III. EVENING CLASSES.

I. GENERAL COURSE

The General Course in Millinery consists of three consecutive grades, each occupying one term. In each grade two lessons in millinery, of two hours each, are given weekly.

This course includes also instruction in drawing and water-color, for the purpose of giving the students a knowledge of line and form, and the ability to execute designs for the various kinds of hats in monochrome and color. One lesson, of one and one-half hours, is given each week, throughout the three grades.

Instruction is provided also in accounts, business forms, and correspondence, two lessons a week being given throughout the grade in which the work may be taken.

A course of lectures in the chemistry of textiles, dyeing, and cleansing is given in the second term of each year.

All materials used are selected and furnished by the students.

Constant use is made of the extensive collection of books in the Library and of the important collection of textiles in the Museum. The leading American and foreign fashion periodicals are supplied in the millinery rooms.

FIRST GRADE

In this grade the work begins with the study of the hat in detail. The methods of preparing the various fittings for the brim are taught upon a straw and a felt hat, canton-flannel and cheese-cloth being used which represent, respectively, velvet and crêpe. After each exercise of fitting the brim, the hats are trimmed with suitable bows of sateen which serves as ribbon. The knowledge so gained is then applied in the making of one hat of choice materials.

SUBJECTS OF INSTRUCTION

- I. Color and materials as related to the head-dress.
- II. Wiring; folds; fitted facing; shirred facing; puffed edge.
- III. Bows and rosettes.
- IV. Study of line and form as applied to frame-making; buckram hat-frames.
- V. Fitted hat made, lined, and trimmed.
- VI. Manufactures of straw and felt hats, velvet, and ribbon explained. Hat of choice material made.

SECOND GRADE

In this grade the bonnet and toque are studied, using for practice materials that are appropriate for the purpose. The latter part of the grade is devoted to the making of bonnets and toques of choice materials.

SUBJECTS OF INSTRUCTION

- I. Bonnet with plain crown and with puffing, made, lined, and trimmed.
- II. Bonnet of more complex design.
- III. Toque made, lined, and trimmed.
- IV. Practical work, regulated by the season in which the grade is studied, and leading to a knowledge of the designing of bonnets and hats. At least four pieces of millinery must be made by each student.

THIRD GRADE

Throughout this grade students work in choice materials, to gain confidence and experience; they are allowed to receive and execute orders.

SUBJECTS OF INSTRUCTION

- I. Crêpe bonnet.
- II. Silk bonnet or hat.
- III. Growth and manufacture of silk explained.
- IV. Wire frame-making.

- V. Hats adapted to the season.
- VI. Evening bonnet from student's own design.
- VII. Shirred hat.

GRADUATE WORK

Students who have finished the three grades of the General Course may remain another term for the purpose of doing more original work and gaining additional practice in dealing with the designs and materials appropriate to the two millinery seasons. The work may consist largely of orders taken by the student.

II. TECHNICAL COURSE

The Technical Course is designed to train students to become practical milliners. In this course the work included in the three terms of the General Course is accomplished in one year.

Three hours on four days of the week—Monday, Tuesday, Thursday, and Friday—are given to millinery. Additional time is required for the other branches.

•Applicants are admitted only in September of each year, and for the entire course.

Students of the Technical Course have the privilege of physical training in the Gymnasium, twice a week, without the payment of an additional fee.

CERTIFICATE

A certificate is granted to students who satisfactorily complete the three grades of the General Course. A certificate is given also to students who complete the Technical Course and pass all the required examinations.

ADMISSION

For admission to any of the courses, students must be at least eighteen years of age and must have a good knowledge of hand sewing. For admission to the Technical Course, applicants are required to present for inspection a piece of millinery, the work upon which must be executed in the classroom of the Institute.

FEES AND TERMS

General Course, *twelve dollars* per term.

Technical Course, *thirty dollars* per term.

There are two terms in the year, beginning, respectively, in September and February.

EVENING CLASSES

In the Evening Classes, instruction is given in the first and second grades of the General Course. The session extends through six months, from the beginning of October to the end of March. Two lessons, of two hours each, are given weekly. The fees for the session are *three dollars* for the first grade, and *five dollars* for the second grade. Full details will be found on page 262.

•

NORMAL COURSE IN DOMESTIC ARTS

INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

CAROLINE A. M. HALL,
Director.

EMILY G. SWETT,
Director of the Millinery Courses.

HÉLÈNE ZOGBAUM,
Instructor in Design in Dressmaking and Millinery.

HARRIET L. MASON,
Professor of English Language and Literature.

MARY L. SARGENT,
Instructor in Dressmaking.

MARY E. EASTWOOD,
Instructor in Dressmaking.

JENNIE COLLINGWOOD,
Instructor in Dressmaking.

MARY HENLEIGH BROWN,
Instructor in Sewing and Dressmaking.

LAURA E. WAGNER,
Instructor in Dressmaking.

ALBERT P. BRUBAKER, M. D.,
Professor of Human Physiology and Hygiene.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

JOHN T. HOLDSWORTH,
Professor of Business Customs and Accounts.

MAUDE G. HOPKINS,
Director of Physical Training.

PRESIDENT MAC ALISTER lectures on the fundamental principles of Manual Training and the educational value and relations of the Domestic Arts.

This course is intended for the training of teachers of domestic arts in public, industrial, and normal schools. It includes the full courses in sewing, dress-making, and millinery given in the General Courses in these branches, and such additional branches as are necessary to give the teacher a thorough and comprehensive knowledge of dress in its relations to the individual and to society. The supply of thoroughly trained instructors in this department of school work is quite inadequate to the demand.

The Gymnasium is a large, well-lighted, and well-ventilated hall. In connection with the Gymnasium, there are suites of dressing-rooms, and finely appointed marble baths with hot and cold water.

The Library is supplied with an extensive collection of books and the Reading-room with the best periodicals relating to the subjects taught in the course.

COURSE OF INSTRUCTION

The course occupies two years. Attendance is required five days each week.

JUNIOR YEAR

FIRST TERM

SEWING.—Theory and practice of hand and machine sewing. The making of simple garments. Skirt drafting.

DRESSMAKING.—First Grade of the General Course. Study of the construction and making of dresses for general use.

MILLINERY.—First Grade of the General Course.
Preparation of materials. Study of the hat. Bow-making.

DRAWING.—Outline and light and shade. Color studies.

BUSINESS TRAINING.—Accounts and business forms.

PHYSICAL TRAINING.—Systematic training in the Gymnasium.

SECOND TERM

SEWING.—Second Grade. The drafting, cutting, and making of undergarments from various designs.

DRESSMAKING.—Second Grade of the General Course.
Drafting for waists. Making three full garments.

MILLINERY.—Second Grade of the General Course.
Suitable materials are first used for practice; the designs are afterward developed in the finished hat made of choice materials.

DRAWING AND COLOR WORK.—Proportions of the human figure. Draperies, bows, feathers as hat-trimming, in black and white and in color. Color values.

PHYSICAL TRAINING.—Systematic training in the Gymnasium.

Lectures and demonstrations on special topics are given throughout the year.

SENIOR YEAR

FIRST TERM

SEWING.—Third Grade. Theory and practice of drafting and making shirt-waist suits; garments for infants. Embroidery.

DRESSMAKING.—Third Grade of the General Course.
Drafting and making elaborate dresses from original designs.

MILLINERY.—The designing and elaboration of hats, toques, and bonnets.

COSTUME.—Early and medieval periods.

BASKETRY AND WEAVING.

DRAWING AND DESIGN.—Rendering of dresses and gowns in black and white and in color. Designing of hats, bonnets, and toques, in black and white and in color.

ENGLISH LANGUAGE AND LITERATURE—Paragraph and letter-writing. English classics.

OBSERVATION AND PRACTICE IN TEACHING.—Guild classes, industrial institutions, and Institute classes.

LECTURES on subjects related to the work.

LECTURES on Human Physiology and Hygiene with special reference to dress.

PHYSICAL TRAINING.—Systematic training in the Gymnasium.

SECOND TERM

SEWING.—Exercise in dress finishing.

DRESSMAKING.—Fourth Grade of the General Course.
Wool and woolen textiles.

MILLINERY.—Original design in head-dress.

HISTORY OF COSTUME.—Class work and lectures with pictorial and stereopticon illustrations.

BASKETRY and its relations to the weaving of cloth.

DRAWING AND DESIGN.—Designing of costumes and head-dresses in color.

ENGLISH LANGUAGE AND LITERATURE.—The paragraph; composition; study of selected classics.

OBSERVATION AND PRACTICE IN TEACHING.—Guild classes and Institute Department classes.

EMERGENCIES.—Practical demonstrations.

LECTURES on the Chemistry of Textiles, Dyeing, and Cleansing.

PHYSICAL TRAINING.—Systematic training in the Gymnasium.

Lectures and demonstrations on special topics are given throughout the year.

DIPLOMA

A diploma is granted to students who complete the course.

EQUIPMENT AND LIBRARY

The Dressmaking and Millinery classrooms are supplied with every appliance and equipment necessary for the instruction.

Constant use is made of the extensive collection of books on costume in the Library and of the collection of textiles belonging to the Museum. The leading American and foreign fashion periodicals are supplied in the dressmaking rooms.

Courses of reading and study in the history of costume are arranged for students desirous of pursuing the same.

ADMISSION

For admission to the Normal Course in Domestic Arts, applicants must give satisfactory evidence of a good general English education. They must present for inspection an article of wearing apparel as a specimen of their hand sewing.

FEES AND TERMS

Fee, *forty dollars* per term.

All materials, stationery, and note-books are supplied by the student.

There are two terms in the year, beginning, respectively, in September and February.

Applicants are admitted to the course only in September.

SUBJECTS OF INSTRUCTION

SEWING

FIRST GRADE.—The first half of the Junior Year is devoted to practice in the various kinds of hand and machine sewing, and to the elementary drafting, cutting, fitting, and making of undergarments.

Instruction is given in the preparation of the various fibres used in the manufacture of washable materials suitable for undergarments—form, style, and line being carefully considered.

The history of implements and their proper uses.

SECOND GRADE.—The fabrics best suited for more elaborate garments; combination of materials and ornament; the selection and the purchase of materials; design and color; drafting, cutting, fitting, and making, by hand and machine, dainty lingerie. Embroidery, laid-work, scallops, initials for marking linen.

THIRD GRADE.—Instruction in selecting materials best fitted for shirt-waist suits and unlined dresses of washable materials. Kimonos, infant's and children's outfits. Treatment and use of cotton textiles. Preparation of lace and embroidery. Ornamentation of garments. Cross-stitch or Russian embroidery. Drawn-work. Drafting, cutting, fitting, and making of garments.

DRESSMAKING

FIRST GRADE.—Instruction in the fundamental principles of making lined dresses; combination of materials and linings; the general finish of garments; boning; the use of stiffening. Materials

and the different staples used in their manufacture. Combination of texture and color. Shopping and purchase of goods. The designing and drafting of skirts; cutting, fitting, and making a lined skirt and a skirt over a foundation, with the waist, making in all three garments.

SECOND GRADE.—The study of form and color; the combination of different dress fabrics, with their relation to the more artistic lines in the finished garment; design and simple decoration; measurements taken and drafting from different models, including gowns made on the princess form; the proper selection and use of striped and figured materials; draperies and their uses. Three garments are completed, the drafting, planning, cutting, and finish from the design being performed by the student.

THIRD GRADE.—Preparation of garments made from more elaborate and expensive materials and of special character; consideration of textures best adapted to the reception and the dinner dress; the evening gown; lined dresses for children. Study of personality; drafting with this end in view.

FOURTH GRADE.—This grade includes the drafting and making of garments of more severe and tailor-made effects; cutting, basting, fitting, pressing; practice in making pockets and collars; lining, and finish of the coat; making buttonholes; sewing on buttons; the general finish of the garments.

MILLINERY

FIRST GRADE.—In this grade the hat is studied in detail. The methods of preparing and placing wire; various kinds of folds; bindings and facings used upon straw and felt hats; covering buckram frames; making bows and rosettes; trimming hats.

Throughout the grade, the work is executed in practice materials.

SECOND GRADE.—The fundamental principles of millinery taught in the First Grade are applied in the drafting and making of frames; hats of straw braid; lace or shirred hats; children's hats.

Special attention is given to line and form, color effects, the artistic combinations of different textures, and to a study of the style best adapted to the individual wearer.

THIRD GRADE.—Toques and bonnets designed and made in suitable practice materials, afterward copied and elaborated in materials appropriate to the season; evening hats; crêpe and silk work.

DRAWING AND DESIGN

Drawing—outline, perspective, light and shade, proportion of the human figure; draperies, bows, feathers, hat trimmings, dresses and gowns, lace, ornamentation, hats, bonnets, and toques, in black and white; study of color values and the appearance of objects. Design and decoration; fabrics and textures used in draperies, gowns, and hats suitable to different types; historic costume and costume for different occasions; composition and illustration of the various objects.

HISTORY OF COSTUME

During the Senior Year a course of lectures is given in the History of Costume, from the earliest period to the present time. These lectures are illustrated by lantern slides, reproductions of ancient and modern pictures, and by fashion-plates.

BASKETRY AND WEAVING

Instruction is given in the methods of making baskets of different weaves and shapes, in cord, raffia, reed, and other materials. Variety of form and design caused by the difference in handling creates an interest in the work and develops a feeling for good form, as well as originality in design. Weaving different patterns in mats and other articles illustrates the making of cloth, and increases the interest in the decorative result, while affording training in firmness of touch and dexterity in handling any material.

LECTURES ON TEXTILES, DYEING, AND CLEANSING

This course includes a brief historical sketch of the use of textiles and the art of dyeing.

This is followed by a description of the more important textiles—cotton, flax, ramie, wool, and silk—and of the microscopical and chemical methods of ascertaining their organic structure.

The materials used in dyeing and the operations preliminary to it, and the chemistry of washing, cleansing, bleaching, and dyeing, are explained.

Some account is given of the natural and artificial coloring matters and of the chemistry of the coal-tar colors, which completes the course.

ENGLISH LANGUAGE AND LITERATURE

The course includes the study of prose style in a few representative writers, with reference to diction, figures, explicit reference, paragraphing, arrangement of material, description, narration, expression, argumentation. The aim of the course is to develop the ability of the student in logical thinking and in effective expression of thought, both orally and in writing.

BUSINESS CUSTOMS AND ACCOUNTS

A practical course in single-entry bookkeeping, involving the use of day-book, ledger, cash-book, bill-book, etc. Students are required to make out bills and receipts, to use check-books and pass-books, and to make deposits in the bank, using the proper forms. This practical work is supplemented with lectures on business customs, notes, drafts, letters of credit, and banking.

PHYSICAL TRAINING

Students taking this course attend the Institute classes in Physical Training twice a week. The close connection between bodily training and the instruction in physiology and hygiene is kept in view throughout the entire course.

JUNIOR COURSE
IN
DOMESTIC SCIENCE AND ARTS
AND
ADVANCED ELECTIVE COURSES

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

ALICE M. BRENNAN, Director,
Instructor in English.

ERNEST A. CONGDON, Ph. B.,
Professor of Chemistry.

CHARLES H. WHEELER, Ph. B.,
Professor of Mathematics.

HARRIET L. MASON,
Professor of English Language and Literature.

MARTHA G. ALLEN,
Instructor in Mathematics.

ALICE ELIZABETH CHASE, B. A.,
Instructor in History.

JOHN T. HOLDSWORTH,
Professor of Civics and Business Methods and Accounts.

ABRAHAM HENWOOD, B. S.,
Instructor in Chemistry.

CAROLINE A. M. HALL,
Director of the Courses in Dressmaking.

EMILY G. SWETT,
Director of the Courses in Millinery.

CORA FOX,
Instructor in Millinery.

MARY H. BROWN,
Instructor in Sewing.

200 JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS

MARY E. FRATZ,
Instructor in Drawing.
HARRIET P. MITCHELL,
Instructor in Cookery.
JENNIE COLLINGWOOD,
Instructor in Dressmaking.
MAUDE G. HOPKINS,
Director of Physical Training.

COURSES OF INSTRUCTION

The following courses are offered:

- I. JUNIOR COURSE.
- II. ELECTIVE COURSES FOR ADVANCED STUDENTS.

I. JUNIOR COURSE

The Junior Course is a non-professional course of prescribed studies for girls, and is designed: (1) To supply that training for the duties and responsibilities of home life which the ordinary academic education fails to give; (2) to lay a broad and solid foundation for the technical work involved in the direct preparation for a profession or a skilled occupation. The course of instruction covers two years.

The course is based upon the recognition of the fact that the training for the practical business of life should have its due place in the education of the individual during the plastic period of life. Experience is constantly showing the soundness of this position.

Of the classes that have thus far been graduated, more than three-fourths of the pupils have developed

aptitudes for one or another of the arts and sciences, and have taken advanced courses in chemistry, physiology and hygiene, domestic science, millinery, or dress-making, with a view, in each case, to following the pursuit as a profession.

As a result of this preparatory training in a well-arranged and soundly correlated course of study, these pupils have the advantage of entering upon the pursuit of their technical courses with good habits of thought and study, and with the ability to feel an intelligent delight in their work.

The course is divided broadly into scientific work, academic work, and technical work—about one third of the time being given to each.

The list of studies is as follows:

JUNIOR YEAR

FIRST TERM

LANGUAGE AND LITERATURE.—Diction, punctuation, letter-writing. Idylls of the King. History of American literature.

GENERAL HISTORY.—Ancient history.

MATHEMATICS.—Review of principles of arithmetic and the metric system, introductory to the study of algebra; algebra begun.

DOMESTIC SCIENCE AND ARTS.—Household economics; cookery—practical instruction in the school-kitchens; talks on foods. Sewing. Millinery.

BUSINESS CUSTOMS AND ACCOUNTS.

DRAWING.—Free-hand; sketching.

202 JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS

SECOND TERM

LANGUAGE AND LITERATURE.—Figures of speech, sentence structure, etymology, composition. History of American literature.

MATHEMATICS.—Elementary algebra completed, including quadratic equations.

GENERAL HISTORY.—Medieval and modern European history.

DOMESTIC SCIENCE AND ARTS.—Household economics; cookery—practical instruction in the school-kitchens; talks on foods. Sewing. Millinery.

BUSINESS CUSTOMS AND ACCOUNTS.

DRAWING.—Free-hand; sketching.

PHYSICAL TRAINING in the Gymnasium, twice a week throughout the year.

CURRENT EVENTS one hour a week during the year.

SENIOR YEAR

FIRST TERM

LANGUAGE AND LITERATURE.—Choice of words, phraseology, synonyms. Selected plays of Shakespeare. History of English literature.

ENGLISH HISTORY.

SCIENCE.—Elements of general chemistry—lectures, laboratory work, and recitations.

DOMESTIC SCIENCE AND ARTS.—Household economics; lectures on care of the house; practical instruction in the school-kitchens. Dressmaking.

JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS 203

CIVICS.—The principles and practical operation of civil government in the United States.

LECTURES ON THE HISTORY OF ART.

SECOND TERM

LANGUAGE AND LITERATURE.—The paragraph, composition, principles of style. Selected plays of Shakespeare. History of English literature.

ENGLISH HISTORY.

SCIENCE.—Elements of general chemistry—lectures, laboratory work, and recitations.

DOMESTIC SCIENCE AND ARTS.—Dressmaking.

CIVICS.—Continued.

II. ELECTIVE COURSES FOR ADVANCED STUDENTS

The Elective Courses are intended only for advanced students who are qualified to make a choice of studies for specialization. These courses are designed for young women who desire a course of training in the sciences or arts, combining with such training, when necessary, courses in the academic branches.

Students may elect a single study or a group course from the several courses specified below.

The Institute affords superior advantages for students who wish to specialize. The following subjects are offered:

SCIENCE.—Mathematics, Physics, Chemistry, Physiology and Hygiene, Physical Training. . (See Special Circulars for the various courses.)

ENGLISH.—Rhetoric and Composition, American and English Literature, Prose Style, Victorian Poets, Contemporary Poets, Civics and History. (See Special Circular of Courses in English Language and Literature.)

DOMESTIC SCIENCE AND ARTS.—Cookery, Millinery, Dressmaking, Household Economy, Chemistry of Foods.

SUBJECTS OF INSTRUCTION

The following outlines furnish information frequently asked for concerning some of the subjects of instruction embraced in the Junior and the Elective Courses.

ELEMENTARY CHEMISTRY

A systematic course, extending throughout the year. The student devotes three hours a week to the study, two hours being given to laboratory work and one hour to lectures and recitations. There are occasional written examinations, held at the discretion of the instructor. While the course is elementary in its nature, it is intended to train the student in the power of observation, to give correct interpretations of what is observed, and particularly to inculcate a scientific habit of thought and reasoning. Nor is the training in manipulation and the arrangement of apparatus the least valuable part of the course.

HOUSEHOLD ECONOMICS

This term covers broadly the instruction in the various subjects that relate to the growth and well-being of the household and of organized society. The instruction is given in a series of lectures and lessons systematically arranged with a view to correlating kindred subjects in their bearing upon the household and upon social life and organization.

The following general outline indicates the scope of the work. It will be noted that every part of the instruction capable of demonstration has its outcome in actual laboratory work.

JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS 205

During the Junior Year, instruction is given in the following subjects: The chemistry of food in its relation to the body; composition of foods; combinations of foods; economy in foods; combustion; classification of food principles—water, ash, carbohydrates, fats, proteids; proportion of food principles present in vegetables, cereals, eggs, milk, cheese, meat, fish; yeast; baking-powders; food adjuncts.

The instruction in cookery during the Senior Year embraces a thorough course in all the ordinary processes of cookery, with individual practice at each lesson. Each pupil performs the whole of the process treated in the lesson, and produces a complete dish from a given receipt. Of the three hours a week, two are given to practice and one to theory.

Lectures are given on the care of the house, including: The kitchen; chemicals for household use; care and cleaning of silver, nickel, iron, paints, copper, tin, marble, woodwork, brass, zinc, porcelain, glass; disposal of household waste; water supply; filtration of water; heating and lighting; care of lamps; care of the dining-room; laundry of table linen; removal of stains; laundry of lace; care of bath-room and bedroom.

The lectures cover one hour each week, followed by practice in the school-kitchens.

SEWING

Practice is given in the various stitches, upon small pieces of material varying from coarser to finer texture. Students provide these materials. Three lessons of one hour a week are given, embracing: *First Term*—Training in measuring by tape-measure and by the eye; basting and overhanding; turning hem by measure, hemming, and running; stitching, combination of stitches; hemstitching; fells; gathering, stroking gathers, and putting on bands; tucks; making a fancy apron. *Second Term*—Sewing machine; making button-holes and eyelets; sewing on buttons; putting in gussets; plackets; mending and patching; drafting, cutting, and making three undergarments.

MILLINERY

The fundamental principles of trimming and making hats, with thorough practice in wiring, binding, puffing, facing (plain and

206 JUNIOR COURSE IN DOMESTIC SCIENCE AND ARTS

shirred), covering of buckram frames, trimming hats in choice materials, making of shirred hats. The course fits the pupil to do thoroughly all her home millinery, and forms a solid basis for a professional course.

DRESSMAKING

Talks on materials used in a dress—manufacture from staple articles; cotton, wool, silk, etc.; talks on color and color combinations in materials; linings and trimmings; drafting for skirt; purchase of materials; planning, cutting, and making a house-dress; making a separate skirt; making a shirt-waist; planning, cutting, and making gown for graduation.

BUSINESS TRAINING

A course of instruction designed to acquaint women with those common business facts and principles which have been generally omitted in a woman's education. The following topics indicate the nature of the instruction: What is money? How is it circulated? What is a bank? A trust company? How do banks and trust companies make their money? Women as stockholders and bondholders. Business papers—checks, promissory notes, etc. Capital and credit, failures, assignments, the legal status of women. Practical work in drawing checks, notes, etc., and in keeping a simple set of books—cash-book, day-book, and ledger—by double entry.

PHYSICAL TRAINING

The importance of physical training in mental and moral, as well as in physical, development can scarcely be overestimated. Great care has therefore been taken to formulate a system of training in accordance with the best recognized theories of human development. The Gymnasium is thoroughly fitted up with the newest and best apparatus for the work, including the bath with all necessary appliances.

Regular students are required to take this course, and special students are strongly advised to do so. In the case of regular students, no additional fee is charged for the course in the Gymnasium.

ATTENDANCE

In the Junior Course, attendance five days a week, and, upon an average, five hours a day, is required. Work begins at 9 a. m., and continues to such hours (up to four o'clock) as the program of studies demands.

The attendance for the Elective Courses varies according to the program for the selected course of study.

GRADUATION

A Diploma is awarded to students who complete the prescribed course.

A Certificate is awarded to students who complete an Elective Course consisting of subjects approved by the Director.

LABORATORIES AND WORKROOMS

The laboratories and workrooms of the Institute are equipped with all the latest appliances, and every facility is afforded the student to pursue the work in a thoroughly scientific manner.

LIBRARY AND MUSEUM

Constant use is made of the Library, in connection with the several lines of study and training. It contains thirty thousand volumes, including works in every department of art, literature, science, and technology. The Reading-room is liberally supplied with periodicals.

The Museum, which contains collections in every department of industrial art and a collection of paintings, is an important adjunct to several of the branches of instruction.

ADMISSION

For admission to the Junior Course, applicants must have at least a good elementary education. An examination in English, United States History, Geography, and Arithmetic is required. Applicants for the Elective Courses must have such preparation as will enable them to pursue profitably the subjects chosen.

A high school diploma, or a certificate or diploma of any institution of equal grade with the high school, may be accepted in lieu of an examination, provided the application is made in person.

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Junior Course, *thirty-five dollars* per term. Advanced and Elective Courses, according to the group of subjects chosen.

The cost of the materials used in the science and the cookery classes is included in the fee.

All the materials used in the dressmaking and millinery classes and all text-books and stationery are supplied by the student.

A deposit of *five dollars* must be made by each student taking chemistry or physics, to cover breakage in the laboratory. This is returned at the close of the year, less the cost of the apparatus destroyed. A deposit of *fifty cents* per term is required also as security for the return of the locker key.

There are two terms in the year, beginning, respectively, in September and February.

LIBRARY SCHOOL

FACULTY AND INSTRUCTORS

JAMES MAC ALISTER, LL. D., President of the Institute.

ALICE B. KROEGER, Librarian and Director of the Library School,
Instructor in Cataloguing, Library Economy, and Reference Work.

ELLA R. SELIGSBURG, B. A., B. L. S.,
Assistant Librarian and Instructor in Library Economy
and Studies of Books and Authors.

FANNIE S. MATHER,
Instructor in Library Economy.

ADÈLE MILLICENT SMITH,
Instructor in Proofreading.

CARL LEWIS ALTMAIER,
Instructor in Typewriting and Correspondence.

JOHN T. HOLDSWORTH,
Instructor in Business Forms.

PRESIDENT MAC ALISTER lectures on The History of Books and
Printing.

The Library School was organized in connection with the Library Department of the Institute in November, 1892, in order to furnish opportunities for the systematic training of librarians and assistants. The function of the library as an important part of the educational system of the country has become generally recognized. In consequence, the librarian's occupation is now con-

sidered a profession, and a special preparation for it a necessity. Graduates of training schools are able to advance more rapidly and to do their work with more satisfaction to themselves, as well as to others, because they have a systematic knowledge of the principles underlying the librarian's work.

The School offers a one year's course in library science. As the instruction is largely technical a good general education on the part of the students is presupposed, a high-school education or its equivalent being a necessity. The broad educational side of the profession is also emphasized, while the literary part of the course is designed to assist the students in gaining the librarian's technical knowledge of books and authors, which can only be acquired by library methods. Graduates of the School are filling positions as librarians, cataloguers, or general assistants, in public, university, and school libraries.

Students are admitted only for the full course.

Certificates are granted to students who complete, satisfactorily, the full course of instruction.

COURSE OF INSTRUCTION

I. CATALOGUING

The instruction in cataloguing is based on the rules of the American Library Association. "The A. L. A. Rules" and Cutter's "Rules for a Dictionary Catalogue" are used as text-books. The instruction is supplemented by practical cataloguing under supervision. The preparation of finding lists and reference lists is also considered.

II. LIBRARY ECONOMY

Includes the following subjects: Library handwriting, accession and order work, classification, shelf-listing, alphabeting, mechanical preparation of books for the shelves, shelf-arrangement, care of periodicals and pamphlets, bookbinding, charging-systems, stock-taking, supplies, statistics, proofreading, typewriting.

ORDER DEPARTMENT.—Lectures on trade bibliography, on the selecting of books and the various processes and methods of ordering them, with practical exercises in selecting and ordering.

ACCESSION DEPARTMENT.—The Library School accession-book rules are used as the basis of the instruction, with practical work in accessioning books.

CLASSIFICATION.—The Decimal classification is taught. Books are assigned for classification and discussed in class. Practical work for the library, under supervision. The Expansive and other systems of classification are described.

SHELF DEPARTMENT.—Shelf-listing by both methods (cards and sheets). Lectures on shelf-arrangement, stock-taking, and other details.

CIRCULATING DEPARTMENT.—Lectures on comparative methods of charging. Practical work at the charging desk of the Institute Library is required of each student. Lectures on access to shelves, information desks, rules and regulations.

BINDING, REBINDING, AND REPAIRING.—The most approved styles of library binding, the processes of binding, and directions for preparing books for the bindery. A visit to a bindery is made at the conclusion of the lectures. A brief outline of the history of bookbinding is also given.

III. STUDIES OF BOOKS AND AUTHORS

This course includes:

1. **PRACTICAL BIBLIOGRAPHICAL STUDIES** of a few representative American and English authors of the nineteenth century, an important feature of the studies being the reference work required of each student in the use of the resources of the library on the subject.

2. **SELECTION OF BOOKS.**—This work is based on the study of the "Publishers' Weekly" and some of the leading English and American critical reviews. Students are required to check each week, in the "Publishers' Weekly," the books considered desirable for certain specified types of libraries. This selection is criticised and discussed in class and a few of the most important publications are selected each week for more extended review and discussion.

IV. REFERENCE WORK AND BIBLIOGRAPHY

This subject includes the study of general encyclopedias, dictionaries, atlases, cyclopedias of special subjects, indexes and keys to periodicals and general literature, concordances, public documents, books and reading, general bibliography and bibliographies of special subjects. Practical questions are given to the students to be looked up in the reference books, with the object of showing how to obtain information on a subject quickly. "Guide to the study and use of reference books," by Alice B. Kroeger, is used as a text-book.

V. LIBRARY HISTORY AND EXTENSION

History of libraries, library associations and commissions, library buildings, library schools, traveling libraries, children's reading, and home libraries.

Study of current library history is made at a session of the class held fortnightly, to report on the various library periodicals, reports, bulletins, etc. Events are looked up also in the daily newspapers and periodicals.

VI. PRACTICAL WORK

In addition to the instruction and lectures, students are required to devote a certain amount of time to practical work, under supervision, in the Library of the Institute, and they serve during the year in all the departments of the Library

Visits are made to the public libraries in Philadelphia and to the more important libraries in New York or Washington.

Each student, during the second term, prepares a bibliography or reference list on some subject approved by the Director.

VII. LECTURES

THE HISTORY OF BOOKS AND PRINTING.

A course of lectures by the President of the Institute, giving a comprehensive outline of the History of Books and Libraries, and the Rise and Development of Printing. The lectures embrace the following subjects:

- I. The Development of Language, Oral and Written. Ancient Systems of Writing. Derivation of the English Alphabet. The Preservation of Literature. Earliest Forms of Permanent Records. Literature, Books, and Libraries in the Ancient Civilizations of the East.
- II. The Literatures of Greece and Rome. The Book in the Classical Age. Alexandria as a Literary Centre. Barbarian Invasions of the Roman Empire. Decline and Extinction of Ancient Culture. Destruction of Books and Libraries
- III. The Book in the Middle Age. The Preservation and the Production of Books in the Monasteries. Development of the Illuminated Manuscript. The Early Renaissance in its Relations to Literature and Books.
- IV. The Later Renaissance. Revival of Learning. Recovery of Ancient Literature. Rome, Florence, and Venice as the Centres of Activity. Multiplication of Manuscripts. The Formation of Modern Libraries.
- V. The Art of Engraving as the Precursor of Printing. The Invention and Diffusion of Printing. The Chief Centres and the Great Masters of Printing. The Printed Book and Its Influence upon Civilization.
- VI. Book Illustration in Ancient, Medieval, and Modern Times.
- VII. Books and Libraries in Europe and the United States. Types of Modern Public Libraries.
- VIII. Makers and Lovers of Books, and their Libraries.

During the past year lectures have been given by Mr. John C. Dana, Librarian of the Free Public Library of Newark, N. J., Dr. Morris Jastrow, Librarian of the Library of the University of Pennsylvania, Mr. George Iles, of New York City, Miss Isadore G. Mudge, Librarian of Bryn Mawr College, Miss Rosalie V. Halsey, of New York City, class of 1903.

PHYSICAL TRAINING

The students of the Library School have the privilege of attending the Institute classes in physical training without additional charge.

LIBRARY AND READING-ROOM

The Library contains thirty-one thousand volumes, and the Reading-room is supplied with one hundred and eighty periodicals.

Among the special collections of the Library are: the Anthony J. Drexel Bequest; the George W. Childs Collection of Manuscripts, presented by him to the Institute; the Charles H. Jarvis Memorial Library of Music; the George M. Standish Collection of general literature, including early printed books, illustrated books, fine editions of Italian and French writers, English books in art, literature, history, etc.; and the valuable and important works on art presented by Mr. James W. Paul, Jr., and others.

ADMISSION

The entrance examination will be held on Wednesday, June 15th, 1904. The subjects include: General literature; a reading knowledge of French and German; general history and general information. As the number of students that can be admitted is limited to twenty, selection is made from those presenting the best examination papers and showing special fitness for the course.

In the case of students unable to attend the examination held in Philadelphia, arrangements can be made for local examinations in places where there is a public or college library, provided the librarian is willing to undertake the conduct of the same. Notice must be given to the Director of the School in time to arrange for the local examinations.

In preparing for the entrance examinations, it is recommended that the applicant should give most attention to the study of literary history and criticism, and general history. Any good outline of these subjects will do as a basis for review. Vertical handwriting is used in most library records. It is therefore of great advantage to the student to have some proficiency in it before entering the School.

FEEES

Full course, *twenty-five dollars* per term.

Students supply their own stationery and other materials, the cost of which is from fifteen to twenty dollars for the year.

TERMS

The full course extends from the first of October until the end of the calendar year, about the middle of June. Applicants are not admitted to the School except at the beginning of the calendar year, in October.

There are two terms in the year, beginning, respectively, in October and February.

Attendance is required five days a week, from 9 a. m. to 4 p. m.

COURSES IN ENGLISH LANGUAGE AND LITERATURE

Open to Special Students

INSTRUCTORS

PROFESSOR HARRIET L. MASON in charge.

ALICE M. BRENNAN.

LILLIAN M. DALTON.

COURSE I.—PREPARATORY

Choice of words; sentence construction; punctuation; social forms; improprieties; etymology; composition work based upon reading.

Study of the "Idylls of the King" as a complete whole.

COURSE II.—RHETORIC

Synonyms; diction; phraseology; style—force, life, emphasis, rapidity, smoothness; the sentence; the paragraph—its sum and structure.

Study of selected plays of Shakespeare. Composition work based upon the plays studied.

COURSE III.—PROSE STYLE

Studies of Bunyan, De Quincey, Burke, Thackeray, Ruskin, Lowell, Carlyle, Huxley, Newman, Arnold, Macaulay, Blackmore, Green, Hughes, Hawthorne, Scott, Mill, Tyndall, Morley, Addison, Curtis, Pater, Stevenson, Hewlett, and Hearn, with a view to illustrating the style and invention of representative authors.

COURSE IV.—PARAGRAPH WRITING

General laws of the paragraph; the isolated paragraph—development by repetition, definition, contrast, explanation, cause and effect, proofs, combination of two or more methods; use of sentence types; ordering of material; scale of treatment. This course gives constant practice in off-hand writing, and is intended to train the student in the rapid expression of his thoughts. All the writing is done in the class. The course may be followed by courses in Expository and Argumentative Writing, as soon as the student develops sufficient power.

COURSE V.—AMERICAN LITERATURE

This course aims to give a continuous development of American literature up to the present time. Syllabuses are given out, which contain references to authors. These the student reads, and at the recitation gives the result of his reading and is led by questioning to see and feel the characteristics of the authors. In this way, he is trained to make deductions for himself, to know books, and to appreciate literature.

COURSE VI.—ENGLISH LITERATURE

This course gives a development of English literature from the Anglo-Saxon age to the present time. The syllabuses used contain references to historical matter that serves as a background, to imaginative literature that clothes the period, and to selections of original writings or to the originals themselves. The Library of the Institute offers opportunities to give a complete-

218 COURSES IN ENGLISH LANGUAGE AND LITERATURE

ness to this course, which otherwise only a college library would make possible.

COURSE VII.—MAJOR VICTORIAN POETS

Studies of Robert Browning, Alfred Tennyson, Matthew Arnold, Algernon Swinburne, with a view to an appreciation of their work, their relation to their times, and their part in the development of English poetry.

COURSE VIII.—THE ROSSETTIS AND THE POETS OF
THE YOUNGER GENERATION

Studies of Dante Gabriel Rossetti, Christina Rossetti, Rudyard Kipling, Stephen Phillips, Henry Newbolt, William Watson, William Butler Yeats.

Courses VII and VIII are given in alternate years.

Course VII will be given in 1904-05.

ADMISSION

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

FEES AND TERMS

Any one of the courses, *ten dollars* per term; any two of the courses, *twenty dollars* per term; any three of the courses, *twenty-five dollars* per term.

There are two terms in the year, beginning, respectively, in September and February.

COURSES IN ENGLISH LANGUAGE AND LITERATURE 219

EVENING CLASSES

From the beginning of October until the end of March, courses in English Language and Literature are open to students in the evening, full information concerning which will be found on page 265.

DEPARTMENT OF PHYSICAL TRAINING

MAUDE G. HOPKINS,
J. PETERSON RYDER, S.B., } Directors.

The Department of Physical Training has been organized for the purpose of furnishing thorough and systematic physical education. The training begins with simple exercises and gradually leads to more complex movements, the aim throughout being the harmonious development of the bodily powers in their relation to sound mental action. The methods of training are founded on physiological and hygienic principles, and are in accordance with the teachings of the highest authorities on physical education. From first to last, the object kept in view is the cultivation of a healthy physique rather than gymnastic feats.

The Gymnasium is a large, well-lighted, and well-ventilated hall, and is unsurpassed in the completeness of its appointments. The apparatus was designed and constructed under the immediate direction of Dr. Edward M. Hartwell, formerly Director of Physical Training in the Boston Public Schools. In connection with the Gymnasium there are dressing-rooms, and separate suites of finely-appointed marble baths with hot and cold water, for men and women.

SPECIAL CLASSES

The Gymnasium is intended primarily for the physical training of the students connected with the several

departments of the Institute, but special classes are conducted as follows:

SPECIAL CLASSES FOR LADIES

MORNING CLASS (Advanced).—Two days per week, at ten o'clock. Monday and Thursday.

AFTERNOON CLASS (Beginners).—Two days per week, at 2.45 o'clock. Monday and Thursday.

FENCING CLASS FOR LADIES

SATURDAY MORNING, at ten o'clock. The class is conducted by Mr. Ryder.

CHILDREN'S CLASSES

There are also Special Classes for Children:

Two days per week, at 4.15 p. m. Monday and Thursday.

The Directors exercise immediate supervision over all the class work and the use of the baths.

The members of all the classes are required to provide themselves with a suitable gymnastic dress.

TERMS

The arrangements for the terms are as follows:

1. **INSTITUTE CLASSES** begin as soon as practicable after the opening of the academic year in September and continue until the close of the year.
2. **SPECIAL CLASSES FOR LADIES**, one term of six months, begin November 1st and continue until May 1st.

3. SATURDAY MORNING FENCING CLASS, one term of six months, begins November 1st and continues until May 1st.

4. SPECIAL CLASSES FOR CHILDREN, one term of six months, begin November 1st and continue until May 1st.

5. SPECIAL STUDENTS (ladies) desirous of devoting more time to the training may attend for two terms of four months each, the first term beginning October 1st and the second term February 1st.

ADMISSION

Application for admission should be made to the Registrar, at the Institute, between 9 a. m. and 4 p. m., or by letter.

Directors' office hours:

Miss Hopkins—one to two, daily, except on Saturdays.

Mr. Ryder—at four o'clock, daily, except on Saturdays.

FEES

SPECIAL CLASSES FOR LADIES, one term of six months, *fifteen dollars*; two terms, of four months each, *ten dollars* per term.

SATURDAY MORNING FENCING CLASS, one term of six months, *eight dollars*.

CHILDREN'S CLASSES, one term of six months, *fifteen dollars*.

A deposit of *fifty cents* per term is required as security for the return of the locker-key.

LECTURES ON ANATOMY AND PHYSIOLOGY

The lectures on Anatomy and Physiology, which are given in the Department of Domestic Science by Dr. A. P. Brubaker, are open to special students and to such other persons as may desire to attend them. These lectures are of special value in themselves, aside from their bearing upon physical well-being.

The course of instruction embraces both lectures and demonstrations. The lectures cover the following topics: the general plan of organization of the human body; the physical and chemical properties of the tissues; the chemical composition and the physiological properties of foods and their relative values as nutritive agents; the general process of digestion; the elaboration of food into blood; the circulation of the blood, respiration, animal heat; secretion and excretion; the physiology of the nervous system and special senses with reference to the lectures on psychology. The laboratory demonstrations have reference to the above course of lectures. Lectures are given also embracing the subjects of physical development, physical training, the effects of diet, the care of the skin, clothing, ventilation, household sanitation, emergencies, and similar hygienic topics.

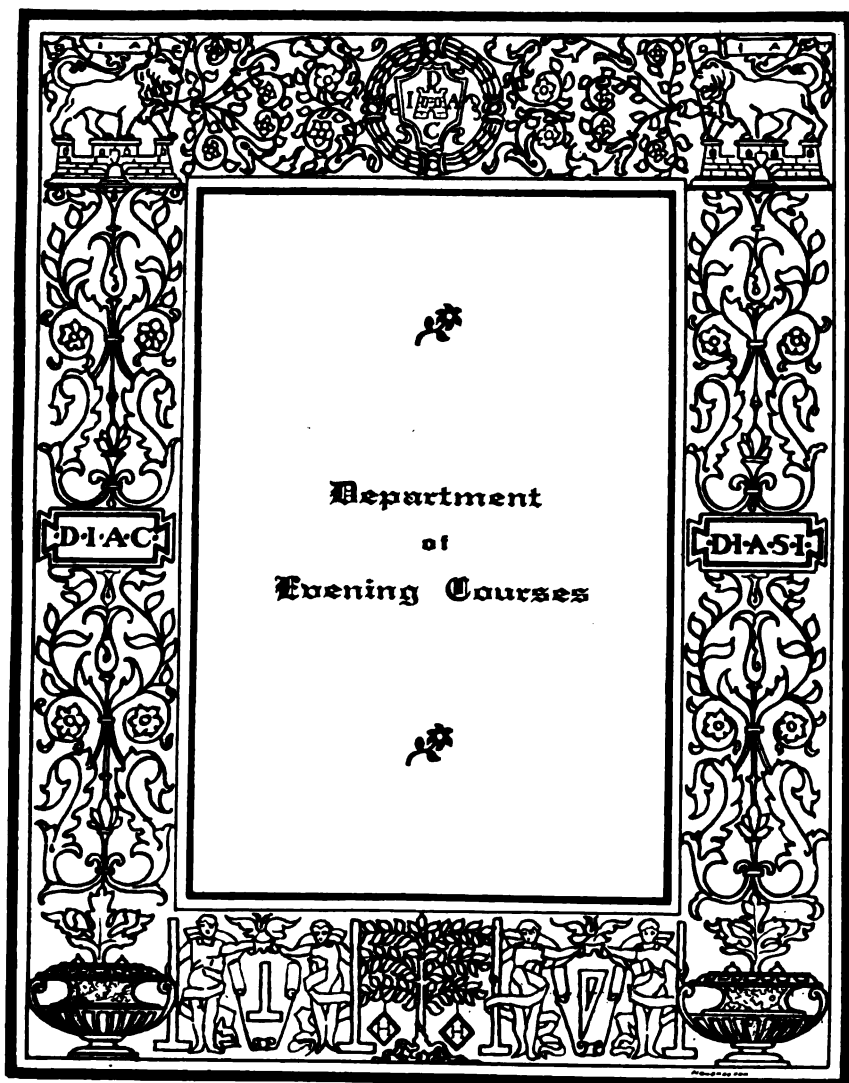
During the Senior Year the laboratory work includes the following topics: the chemical relation of starch, sugar, fat, and proteids; the determination of the heat values of food; the process of fermentation; the cultivation of micro-organisms and their relation to disease; dissections of different animal forms generally used as foods. The lectures embrace the following topics:

ptomaines and leucomaines of foods and their influence in the production of disease; the parasites usually associated with animal foods; diseases of nutrition, such as gout, diabetes, rickets, scurvy, and rheumatism.

An additional fee of *ten dollars* per term is charged for the first course, and of *five dollars* per term for the second course.

EVENING CLASSES

Separate Evening Classes for young men and young women are provided during the winter months. The fee for each class is *five dollars* for the session of six months. Full information concerning these classes is given on page 266.



DEPARTMENT OF EVENING COURSES

There is a separate circular for each of the courses named below.

I. ART COURSES

Freehand Drawing.
Drawing from the Antique.
Life.
Clay Modeling.
Wood-Carving.

II. ARCHITECTURAL COURSES

Architectural Drawing.
Architectural Design.
House Construction Drawing.
Building Construction.
Pen and Ink Rendering.
Water-Color Rendering.

III. SCIENCE COURSES

Mathematics.
Physics.
Chemistry.

IV. ELECTRICAL ENGINEERING SUBJECTS

Applied Electricity.
Engineering Electricity.
Telephony.

Dynamo Design.
Alternating Current Engineering.
Electric Light Engineering.

V. MECHANICAL ENGINEERING SUBJECTS

Strength of Materials and Applied Mechanics.
Steam-Engines and Boilers.
Design of Machine Elements and Power Transmission
Devices.
Advanced Machine Design.

VI. MECHANICAL DRAWING

VII. SHOPWORK

Woodworking.
Benchwork in Iron.
Machine Construction.
Forging.

VIII. COMMERCIAL COURSES

Bookkeeping, Commercial Arithmetic, and Penman-
ship.
Advanced Accounting.
Stenography and Typewriting.

IX. DOMESTIC SCIENCE

Cookery—two consecutive courses.

X. DOMESTIC ARTS

Dressmaking.
Millinery.
Sewing—hand and machine sewing, and the making of
simple garments.

XI. ENGLISH LANGUAGE AND LITERATURE

Three consecutive courses in Composition, Rhetoric,
and American and English Literature.

XII. PHYSICAL TRAINING

XIII. CHORAL MUSIC

The Choral Class.

The Drexel Chorus.

ART COURSES

I. FREE-HAND DRAWING.—Monday and Wednesday evenings, at 7.30. MARY E. FRATZ, Instructor. Fee, *five dollars*.

II. DRAWING FROM THE ANTIQUE.—Tuesday and Thursday evenings, at 7.30. JAMES L. WOOD, Instructor. Fee, *five dollars*.

III. WOOD-CARVING.—Ornament of various kinds; carved enrichments for furniture; frames; architectural decorations, etc. Tuesday and Thursday evenings, at 7.30. JOHN J. MAENE, Instructor. Fee, *five dollars*.

IV. CLAY MODELING: ELEMENTARY AND LIFE CLASSES.—Monday and Wednesday evenings, at 7.30. JOHN J. MAENE, Instructor. Fee, *five dollars*.

V. COMPOSITION AND PICTURE CONSTRUCTION.—For men and women. Monday and Wednesday evenings, from 7 to 10. JAMES L. WOOD, Instructor. Fee, *five dollars*.

This course offers instruction in the making of pictures or illustrations from the standpoint of their composition. It embraces the study of the costumed model in various mediums and the setting up of the final sketch for a picture.

VI. LIFE CLASS.—For men, Tuesday, Thursday, and Friday evenings; for women, Monday and

Wednesday evenings, from 7 to 10. JAMES L. WOOD,
Instructor. Fee, *seven dollars*.

ARCHITECTURAL COURSES

- I. COURSE IN ARCHITECTURAL DRAWING.
- II. COURSE IN ARCHITECTURAL DESIGN.
- III. COURSE IN HOUSE CONSTRUCTION DRAWING.
- IV. COURSE IN BUILDING CONSTRUCTION.
- V. COURSE IN PEN AND INK RENDERING.
- VI. COURSE IN WATER-COLOR RENDERING.

These courses are intended primarily for the training of special expert architectural assistants, and are arranged with that end in view, each class being in charge of a professor or instructor especially adapted to the work and actively engaged in daily professional practice. The training is of such a character that students engaged in the allied arts of decoration, architectural sculpture, etc., may profit by the instruction.

PREPARATORY CLASS.—For students who have not had the requisite preparatory training in mechanical drawing.

The work of this class is the study of sections and projections, with special reference to the work in the Architectural Drawing and House Construction Drawing Classes, the object being to give students a thorough training in practical draftsmanship. Fee, *five dollars*.

I. COURSE IN ARCHITECTURAL DRAWING. PROFESSOR JOHN J. DULL in charge. EDWARD P. SIMON, Instructor. Tuesday and Thursday evenings, at 7.30.

Students in this class must have taken one full session in Preparatory Class, or have a knowledge of drawing equivalent to the instruction given in that class.

The work includes the mechanical projection of shades and shadows; the study of the classic orders, their principals and proportions, and the uses of their various mouldings and parts; with the making of wash drawings in monotone of the same with cast shadows. This work is followed by lectures on perspective and the development of the architectural styles, and the drawing of the distinctive ornamental features of these styles.

Examinations are held in the middle and at the end of each session, to determine the standing and progress of the students.

Fee, seven dollars.

II. COURSE IN ARCHITECTURAL DESIGN. PROFESSOR JOHN J. DULL in charge. Tuesday and Thursday evenings, at 7.30.

The work of this course consists of a series of problems in design, with a critical review of the work at the completion of each problem.

Requirements for Admission.—Applicants who have obtained the certificate of the Class in Architectural Drawing are admitted without further examination. Other applicants are received on the approval of the professor in charge.

Fee, six dollars.

III. COURSE IN HOUSE CONSTRUCTION DRAWING. PROFESSOR JOHN J. DULL in charge. EDWARD P. SIMON, Instructor. Tuesday and Thursday evenings, at 7.30.

Requirements for Admission.—Same as for the Course in Architectural Drawing.

The work includes the drawing of plans, elevations, details of construction work, and the study of specifications.

Lectures on plumbing, heating, and lighting are given in connection with the work on specifications.

Examinations are held in the middle and at the end of each session.

Fee, six dollars.

IV. COURSE IN BUILDING CONSTRUCTION. PROFESSOR HOWARD S. RICHARDS, B. S., in charge. EDWIN CLARK, Instructor.

This course offers to persons engaged during the day opportunity for the theoretical and practical study of the architectural and engineering problems involved in building construction, similar to that of the regular day classes, the only difference being the length of time which can be devoted to the work. All the resources of the department are brought into requisition, and the instruction is carried as far as the attainments and application of the students warrant.

The full course, leading to a graduate certificate, occupies two sessions, of six months each, but students

are admitted for a single session to either of the classes for which they have the necessary preparation.

The preparation in mathematics and mechanical drawing required for admission to the course can be obtained in the evening classes in these subjects.

The course is arranged as follows:

First-Year Class.—Wednesday evening, at 7.30. Lectures on the strength of building materials, investigation and calculation of the strength of tension members, compression members, beams, plate-girders, foundations, etc. Graphic analysis of the stresses in the ordinary forms of roof-trusses. Calculation of the weights of materials and of the usual loads upon floors, roofs, etc.

Second-Year Class.—Saturday afternoon, 2 to 5. Lectures on the design of structural parts and the best and most economical forms of construction. Advanced calculations. Design and detail of complete constructions. Specifications.

Drawing and Testing Class.—Monday evening, at 7.30. For both the First-year and the Second-year Class. Drawing of details of foundations, columns, roof-trusses, joints in wood and steel construction, timber work, riveted steel work, pin-connected work, and all kinds of structural detail. Testing of strength of stone, brick, and cement; also tension, compression, and transverse tests of steel and timber, and of the various combinations used in building construction.

Equipment.—The Institute is equipped with all appliances for making these tests in the latest and most approved manner, including a 200,000-pound Olsen Automatic and Autographic Machine and a Standard Cement Tester.

Certificate.—In order to obtain a graduate certificate, a student must complete the full course of two years and must prepare, as a thesis, the design and detail of a satisfactory piece of construction.

Requirements for Admission.—For admission to the First-year Class, a knowledge of Elementary Mathematics (Algebra and Plane Geometry) and Mechanical Drawing is required; to the Second-year Class, a knowledge of the subjects embraced in the First-year Class.

Fees.—First-year Class, *six dollars*; Second-year Class, *seven dollars*.

V. COURSE IN PEN AND INK RENDERING. PROFESSOR ARTHUR TRUSCOTT, Instructor. Friday evening, at 7.30.

The course occupies one session, and is devoted primarily to architectural subjects and to the rendering of buildings and accessories.

Requirements for Admission.—A sufficient knowledge of drawing to satisfy the professor in charge that the student can profit by the instruction. Drawings must be submitted.

Fee, *six dollars* per session.

VI. COURSE IN WATER-COLOR RENDERING. PROFESSOR JOHN J. DULL, Instructor. Wednesday evening, at 7.30.

The Water-Color Class aims to furnish the architectural draftsman with one of the most valuable qualifications for architectural work—the effective, strong, and rapid rendering in color of perspectives and architectural subjects.

Requirements for Admission.—The same as for the Course in Pen and Ink Rendering.

Fee, *six dollars* per session.

In all the Architectural Drawing Classes the instruction is largely individual, and students showing special aptitude for the work are advanced as rapidly as their attainments permit.

Equipment.—The Institute is thoroughly equipped with the appliances necessary for carrying on the work, including a collection of architectural casts, models of interior construction and finish, etc., etc.

Of the special drawing equipment necessary to each student, the Institute furnishes drawing-boards only. Students supply themselves with drawing instruments, paper, etc. In connection with the Institute there is a supply store where these articles can be obtained. Lockers are provided for instruments, etc. A deposit of *fifty cents* is required as security for the return of the locker-key.

- *Library and Reading-room.*—The Library contains an extensive collection of valuable and important books on architecture. There is also an extensive collection of architectural photographs, to which additions are constantly made.

The Reading-room is supplied with the leading architectural periodicals.

A Special Reference Library and Reading-room, communicating with the classrooms, is provided for the use of the Architectural Classes.

SCIENCE COURSES.

MATHEMATICS

PROFESSOR CHARLES H. WHEELER, Ph. B., KATHARINE D. BROWN, B. S., MARTHA G. ALLEN, GEORGE A. HUGGINS, GEORGE A. GRACEY, Instructors.

COURSE I. BEGINNERS COURSE IN ALGEBRA AND GEOMETRY, embracing fractions, involution, evolution, simultaneous equations of the first degree in algebra; the straight line, circle, and original exercises in geometry.

Algebra, Tuesday. Geometry, Thursday. Fee, *five dollars*. Requires previous knowledge of arithmetic.

COURSE II. ALGEBRA AND GEOMETRY, embracing theory of exponents, quadratic equations, proportion, the progressions, logarithms in algebra; the completion of plane geometry.

Algebra, Monday. Geometry, Wednesday. Fee, *five dollars*. Requires previous knowledge of Course I.

COURSE III. PLANE TRIGONOMETRY, embracing the solution of right and oblique triangles, trigonometrical identities and equations, and a variety of practical problems in heights and distances.

Wednesday. Fee, *five dollars*. Requires previous knowledge of Courses I and II.

COURSE IV. PRACTICAL CALCULUS FOR ENGINEERS. An elementary course for engineers, in the essentials of calculus and analytical geometry, requiring only a knowledge of Courses II and III. Whatever knowledge of analytics may be required for calculus is given in connection with the calculus.

Tuesday. Fee, *seven dollars*.

COURSE V. MECHANICS.—The elements of theoretical mechanics, with application to many practical problems.

Monday. Fee, *five dollars*. Requires previous knowledge of Courses II and III.

A deduction is made in the fee when two courses are taken at the same time.

A certificate is granted to students who finish the first four courses, or Courses I, II, III, and IV.

Students furnish their own text-books.

PHYSICS

PROFESSOR WILLIAM L. BAILIE, LIEUT. U. S. N.,
FLOYD K. RICHTMYER, A. B., Instructors.

LECTURES AND LABORATORY COURSE, WITH RECITATIONS.—The course is chiefly intended for students who are preparing for the evening courses in Electrical and Mechanical Engineering Subjects, for which some knowledge of Physics is necessary. One lecture a week is given throughout the session, in the principles and laws of the science, which are explained by suitable experiments. Two hours a week are devoted to

laboratory work, for the purpose of familiarizing the student with the apparatus, methods of experimentation, and the logical deductions therefrom.

The subject of Mechanics receives careful treatment, inasmuch as it is the foundation of the subsequent work. The laboratory work admits of the use of simple apparatus, and, to a large extent, is illustrative of the lectures.

Tuesday and Thursday. Fee, *ten dollars*.

A deposit of *three dollars*, as security against breakage of apparatus, is required of each student in Physics. This is returned at the close of the session, less the cost of the apparatus injured.

CHEMISTRY

COURSE I. GENERAL CHEMISTRY.—Lectures and laboratory work. Monday and Thursday. PROFESSOR ERNEST A. CONGDON, Ph. B. ROLAND W. WHITE, Instructor. Fee, *five dollars*.

COURSE II. ELEMENTS OF QUALITATIVE ANALYSIS.—Laboratory work. Monday and Thursday. PROFESSOR ERNEST A. CONGDON, Ph. B. ROLAND W. WHITE, Instructor. Fee, *six dollars*.

COURSE III. ELEMENTS OF QUANTITATIVE ANALYSIS.—Laboratory work. Tuesday and Wednesday. Assistant Professor, ABRAHAM HENWOOD, B. S. Fee, *seven dollars*.

COURSE IV. ADVANCED QUANTITATIVE ANALYSIS.—Laboratory work. Tuesday and Wednesday. Assistant Professor, ABRAHAM HENWOOD, B. S. Fee, *seven dollars*.

COURSE V. TECHNICAL ANALYSIS.—Tuesday and Wednesday. Assistant Professor, ABRAHAM HENWOOD, B. S. Fee, *seven dollars*.

This course is designed for advanced students who desire to fit themselves for dealing with the practical problems of engineering chemistry. The course embraces the following subjects:

Fuel.—Proximate analysis of coal; moisture, volatile matter, coke, ash, and sulphur. Specific gravity and calorific value.

Gas.—Determinations of carbon dioxide, oxygen, carbon monoxide, hydrogen and nitrogen, employing the Elliott, Fisher-Orsat, and Hempel forms of apparatus.

Water.—Total solid matter, temporary and permanent hardness, chlorides, sulphates, nitrates, also silica, iron oxide, alumina, lime, magnesia, potash, and soda.

Lubricating Oil.—Specific gravity, viscosity, cold tests, flashing point, loss in weight on exposure to elevated temperatures, tendency to oxidize and gum, percentage of mineral and of fatty oil, free fatty acid, free mineral acid, suspended matters, rosin oil.

A deposit of *three dollars*, as security against breakage, is required of students in the Chemistry classes. This is returned at the close of the session, less the cost of the apparatus destroyed. A deposit of *fifty cents* is required also as security for the return of the locker-key.

COURSES IN ELECTRICAL AND MECHANICAL ENGINEERING SUBJECTS

The Evening Courses in Electrical and Mechanical Engineering Subjects are offered for persons unable to avail themselves of the more advanced and systematic work of the day classes. The instruction is given by the regular staff of teachers and by specialists actively engaged in directing electrical and mechanical engineering work.

CLASSROOMS AND LABORATORIES

THE ENGINEERING CLASSROOMS AND LABORATORIES are located on the ground and first floors of East Hall, entrance to which is through the Main Building. Students attending the evening classes have the use of the same extensive appliances for instruction as the day students.

THE ELECTRICAL LABORATORIES are equipped with a complete outfit of modern electrical machinery and testing apparatus. The Dynamo Laboratories contain examples of nearly all types of D. C. and A. C. dynamos and motors in use; of arc and incandescent lamps; of transformers, and all proper instruments for making tests of them. The dynamos are operated through a counter-shaft by a seventy-five horse-power Porter-Allen engine, or a motor, as may be required. Current

is distributed through an elaborate system of laboratory switchboards.

The Galvanometer Laboratory is well equipped for the general work of Courses I and II, as well as for the special work of Courses III and IV. Among the apparatus and instruments available are resistance boxes, condensers, galvanometers, wheatstone bridges, voltmeters, and a variety of special devices to facilitate experimental work. There are also examples of the standard and the most recent telegraph and telephone apparatus.

MECHANICAL LABORATORIES.—The equipment of the Mechanical Laboratories is ample, including a Porter-Allen seventy-five horse-power engine; a Corliss engine of fifty horse-power; and an Armington & Sims double-vertical twenty horse-power engine. Conspicuous among the gauges, thermometers, indicators, and other instruments usually found in mechanical laboratories, is a 200,000 pound testing-machine, built by Tinius Olsen, which is arranged for tensile, compressive, and transverse tests.

The extensive power-plant of the Institute is available also for practice in engine indicating and in steam-engine and boiler testing.

THE DRAWING-ROOM for Work in Machine Design is a large and well-lighted room, provided with convenient desks, and with separate drawers for tools, materials, and text-books. There is a large collection of blue-prints, photographs, drawings, trade catalogues, and engineering reference books for the use of the students.

ADMISSION ·

On the evenings of September 26th, 27th, 28th, 29th, and 30th, and on Saturday afternoon, October 1st, Professor Rowland will be at the Institute for the purpose of conferring with persons intending to enter the courses. As the number of applicants is usually in excess of the number that can be received, early application is advisable. Application forms may be obtained from the Registrar. They may be filled out at any time in advance of the above dates and sent to the Registrar's office.

FEES AND EXPENSES

The fees for the several courses are given in their respective places. For some courses, a deposit of *five dollars* is required, as security against breakage of apparatus. This is returned at the close of the session, less the cost of the apparatus injured or destroyed.

Students supply their own text-books, drawing instruments and materials, and note-books. Syllabuses and outlines to accompany the various courses are supplied to the students at a nominal price.

ELECTRICAL ENGINEERING SUBJECTS

PROFESSOR ARTHUR J. ROWLAND in charge. WILLIAM B. CREAGMILE, CHARLES E. BONINE, W. B. HODGE, WILLIAM D. FORSTER, GEORGE A. PIERCE, HERBERT R. ROWLAND, R. M. BOYKIN, Instructors.

Admission to each of the Electrical Courses is by written examination, or on presentation of satisfactory credentials. The evenings for examination are: Arith-

metic and Mathematics, Monday, October 3rd; Physics and Electricity, Tuesday, October 4th.

The following courses are offered:

- I. APPLIED ELECTRICITY.
- II. ENGINEERING ELECTRICITY.
- III. TELEPHONY.
- IV. DYNAMO DESIGN.
- V. ALTERNATING CURRENT ENGINEERING.
- VI. ELECTRIC LIGHT ENGINEERING.

COURSE I. APPLIED ELECTRICITY.

The course embraces the Simple Theory of the Electric Circuit and its common applications in lighting and power distribution, etc., with laboratory work in testing.

This course is intended for men who have not the time to devote to the study of physics and mathematics, and is designed to give a knowledge of the principles regulating the flow of current in an electric circuit and the application of these to systems in common use for lighting and power distribution. The special purpose of the course is to prepare the student to handle, with intelligence, electrical machinery and circuits.

At the beginning of the session some time is given to mensuration, algebraic forms, and simple mechanical problems. The electrical work starts with primary and secondary batteries, dynamos, motors, incandescent and arc lamps; this is followed by an elementary study of alternating current principles.

The course extends through one session of six months.

The class meets two evenings a week, at 7.30: on Monday for lectures and recitations; for laboratory work on such other evening as may be selected. Each student is entitled to one evening of laboratory work a week.

An examination for admission is required in simple Arithmetic, including mixed numbers, decimals, percentage, and proportion.

Fee for the session, *ten dollars*.

Each student is required to make a deposit of *five dollars*, as security against injury to apparatus. This is returned at the close of the session, less the cost of the apparatus injured or destroyed.

COURSE II. ENGINEERING ELECTRICITY

A systematic course extending through two sessions, embracing lectures on the Theory and Practical Application of Continuous and Alternating Currents. The electrical measurements and tests used in general engineering work are made in the laboratories.

The work of this course is intended to furnish to men, unable to attend the regular Electrical Engineering Course of the day classes, opportunities to study the same topics as are presented in a high-grade scientific course in electricity. Those who already have some elementary knowledge of the subject are best able to pursue the work. Recent graduates from the Philadelphia Manual Training Schools, or from schools of equal grade, are received without examination. Other applicants must have a knowledge of Laboratory Physics, Elementary Algebra, Plane Geometry, and Plane Trigonometry, equivalent, at least, to the in-

struction given in the various courses dealing with these subjects in the Drexel Institute evening classes. Proficiency in these subjects is determined by examination. Applicants for admission who have not studied Trigonometry may take up that subject in the regular evening classes of the Institute, while pursuing the first year's work of the course.

The course extends through two sessions of six months each.

In the first year of the course, Tuesday is devoted to class-work; in the second year, Friday. The laboratory work of both years is performed on such other evenings as may be selected. Each student is entitled to one laboratory evening a week.

Fee for the session, *ten dollars*.

Each student is required to make a deposit of *five dollars*, as security against breakage of apparatus. This is returned at the close of the session, less the cost of the apparatus injured or destroyed.

COURSE III. TELEPHONY

This course includes the general range of telephone work, and is not confined to the methods and apparatus of any one company. It is thoroughly practical and is intended to be of special value to men already engaged in telephone work. The laboratory training is largely individual. Experiments to illustrate principles, the connections of apparatus, and the tests made on lines and cables are assigned to the student.

The course extends through the session of six months.

The class meets on Monday and Thursday evenings, at 7.30.

The requirements for admission are the same as for Course I.

Fee for the session, *ten dollars*.

Each student is required to make a deposit of *five dollars*, as security against breakage of apparatus. This is returned at the close of the session, less the cost of the apparatus injured or destroyed.

COURSE IV. DYNAMO DESIGN

A course of twelve lectures, dealing with the practical side of Direct Current Machine Design. The work is intended to give an outline of the application of theory to practical dynamo and motor calculation, and to familiarize the student with the general order of procedure and the criteria of good design, including methods of planning machines to meet specifications.

The lectures are illustrated by examples of materials used, and, so far as practicable, by parts of machinery of special interest on which some work has been done.

One lecture a week is given, beginning at the opening of the session.

For admission, previous knowledge of Course II or its equivalent is required.

Fee for the course, *five dollars*.

COURSE V. ALTERNATING CURRENT ENGINEERING

A course of twelve lectures, dealing mainly with Poly-phase Alternating Current Apparatus and problems connected with distributing circuits. Dynamo, transformer, and line design are discussed in their relation to problems of distribution. The work is a continuation of the Alternating Current work of Course II.

One lecture a week is given, beginning after the Christmas holidays.

For admission, previous knowledge of Course II or its equivalent is required.

Fee for the course, *five dollars*.

COURSE VI. ELECTRIC LIGHT ENGINEERING

A course of twelve lectures, dealing with different lights and systems of lighting, with reference to their characteristic features, relative value, and cost. Other subjects, such as methods of installing wiring, load factor, all-day efficiency, and choice of generating units, are discussed. Examples are given of specification and contract forms.

One lecture a week is given, beginning at the opening of the session.

For admission, previous knowledge of Course II or its equivalent is required.

Fee for the course, *five dollars*.

Students may take Courses V, VI, and VII together, with a certain amount of laboratory work, in which case the fee is *ten dollars*.

MECHANICAL ENGINEERING SUBJECTS

**PROFESSOR A. THEODORE BRUEGEL, MR. MOORE,
MR. KINNEY, Instructors.**

The following courses are offered:

- I. THE STRENGTH OF MATERIALS AND APPLIED MECHANICS.**
- II. STEAM-ENGINES AND BOILERS.**
- III. DESIGN OF MACHINE ELEMENTS AND POWER TRANSMISSION DEVICES.**
- IV. ADVANCED MACHINE DESIGN.**

**COURSE I. THE STRENGTH OF MATERIALS AND
APPLIED MECHANICS**

The instruction is by recitations and lectures, supplemented by laboratory experiments. The course comprises a study of the fundamental principles of applied mechanics and their application in the investigation of the strength of materials, a brief discussion of the physical properties of the materials of construction, and numerous applications to practical problems. It includes also the making of laboratory tests of rods, beams, columns, shafts, cements, etc., for tension, compression, and transverse strength; for deflection; and for shearing and torsional resistance.

Among the subjects dealt with are: Work and energy; friction and lost work; dynamics of simple machines; resolution of forces; graphical analysis of stresses; moments of forces; inertia stresses; moments of inertia; stress and strain; elastic and ultimate strength; methods of testing; bending moments; centre of gravity;

calculation of stresses in beams and in the simpler framed structures; power transmission of shafts; formulas used in design, with practical applications; study of stresses due to change in temperature and to impact loads; safe loads for columns; outline of metallurgy of iron and steel.

The course extends through the session of six months.

The class meets on Tuesday and Friday evenings, at 7.30.

For admission, the applicant must satisfy the instructor that he can satisfactorily carry on the work. It is important that persons desiring to enter should present themselves at an early date, as the number that can be received is limited.

Fee for the course, *ten dollars*.

COURSE II. STEAM-ENGINES AND BOILERS

The instruction in Steam-Engines and Boilers is by lectures, recitations, and practical laboratory practice. It includes: the study of heat and its relation to work; the properties of steam; the combustion and evaporative power of fuels; indicator diagrams and the determination therefrom of horse-power, steam consumption, and cylinder condensation; types of engines; condensers; the plain slide-valve, piston, and double-ported valves; link motions; Corliss and other valve-gears; valve diagrams; Watt, Porter, and shaft governors; fly-wheels.

The subject of Boilers includes: Types of boilers—shell, water-tube, fire-tube, locomotive, marine; heating surface and grate surface; stayng and other details;

settings; safety-valves; computation of stresses; boiler performance and efficiency.

The laboratory exercises include the study and use of different makes of indicators in the "indicating" of steam-engines; forms of reducing motions; calculation, from the card, of horse-power and weight of steam used; valve-setting by measurement and by indicator card; measurement of power delivered; measurement of moisture in steam; testing indicator springs and steam-gauges; efficiency test of engines and boilers.

The course extends through the session of six months.

The class meets on Monday and Wednesday evenings, at 7.30.

For admission the requirements are the same as for Course I.

Fee for the course, *ten dollars*.

COURSE III. DESIGN OF MACHINE ELEMENTS AND POWER TRANSMISSION DEVICES

This course aims to start the student in the actual designing of machinery. It presupposes a knowledge of mechanical drawing. It begins with the application of the principles of mechanism and strength of materials to machine elements and power transmission devices, and includes: the various means of communicating motion; quick-return linkages; pulleys and belting; gearing; journals and bearings; shafts, couplings, and hangers; pipes and fittings; hydraulic cylinders and riveted joints; the designing of jib-cranes, machine details, and simple machines.

The instruction is largely individual, and mainly over the drawing-board.

The course extends through the session of six months.

The class meets on Monday and Wednesday evenings, at 7.30.

For admission to this class, the student must have a fair knowledge of mechanical drawing and elementary mathematics. No formal examination is required, but the applicant must personally satisfy the instructor that he can satisfactorily carry on the work. The student who has not had the equivalent of the course in the Strength of Materials and Applied Mechanics will find it greatly to his advantage to take that course while pursuing the course in the Design of Machine Elements.

Fee for the course, *ten dollars*.

COURSE IV. ADVANCED MACHINE DESIGN

The course is intended for those who have already had some training in machine design. It presupposes a knowledge of the fundamental principles of Applied Mechanics and Strength of Materials, and the ability to make an acceptable working drawing. It includes the design, in whole or in part, of machine tools, hoisting and conveying machinery, hydraulic presses, pumps, boilers, steam-engines, and auxiliaries. For the design of steam machinery, a knowledge of the course in Steam-Engine and Boilers, or equivalent preparation, is required. With a sufficient number of properly qualified applicants, a class will be formed in the design of marine machinery, under a specialist in this branch.

The work is largely individual, and more extensive than can be accomplished in one session, but each student is assigned problems suited to his preparation and, so far as possible, in line with his desire for specialization.

The course extends through the session of six months.

The class meets on Tuesday and Friday evenings, at 7.30.

For admission, the applicant must satisfy the professor in charge, by personal interview, of his ability to do the work.

Fee for the course, *ten dollars*.

COURSE IN MECHANICAL DRAWING

BLAIR N. REILEY in charge. H. J. BUR, FRANK T. WEILER, EDWARD C. MOORE, Instructors.

This course is intended to meet the needs of persons to whom a knowledge of Mechanical Drawing is necessary and whose daily employment makes it possible for them to attend only in the evening.

So far as possible, the instruction is the same as that given in the day course; the only difference being in the amount of time devoted to the work.

The full course of instruction is divided into three years, as follows:

FIRST YEAR.—Use of mathematical instruments, orthographic projections, intersections, development of surfaces. Fee, *five dollars*.

SECOND YEAR.—The application of the development of surfaces to machine construction; detailed working drawings of machinery. Fee, *six dollars*.

THIRD YEAR.—Practical working drawings in machine construction.

Monday and Wednesday, Tuesday and Thursday. Fee, *six dollars*.

CERTIFICATE.—The certificate of the Department of Evening Courses is granted to students who complete the three years' course and pass satisfactory examinations in the work prescribed.

COURSES IN SHOPWORK

I. WOODWORKING.—Exercises in sloyd, joinery, turning, pattern-making. Tuesday and Thursday. R. WILLETTE CLINGER, Instructor. Fee, *five dollars*.

II. BENCHWORK IN IRON.—Chipping and filing. Monday and Wednesday, Tuesday and Thursday. CLEMENT E. MOSSOP, Instructor. Fee, *five dollars*.

III. MACHINE CONSTRUCTION.—Use of machine tools and practical work in the building of machinery. Monday and Wednesday, and Tuesday and Thursday. CLEMENT E. MOSSOP, Instructor. Fee, *five dollars*.

IV. FORGING.—Exercises in forging and welding, forging and tempering of machine tools, ornamental work from designs. THOMAS McCREIGHT, Instructor. Tuesday and Thursday. Fee, *five dollars*.

The shops are equipped with every appliance necessary for the instruction.

A deposit of *three dollars*, as security against breakage of tools, is required of students in the Machine Construction Class. This is returned at the close of the session, less the cost of the tools injured.

COMMERCIAL COURSES

PROFESSOR PARKE SCHOCH, A. M., Director. PROFESSORS CHARLES D. CLARKSON, JOHN T. HOLDSWORTH, Ph. B., CARL LEWIS ALTMAIER, JONATHAN J. SPARLING. CAROLYN H. LOCKE, Instructor.

The following courses are offered: •

I. COURSE IN BOOKKEEPING, COMMERCIAL ARITHMETIC, AND PENMANSHIP

The work of this course is divided into three years, as follows:

First Year.—Bookkeeping. Elements of single and double entry, with incidental instruction in business forms and customs.

Commercial Arithmetic. Rapid drill; fractions, weights and measures; discount; interest.

Penmanship.—A plain, rapid business hand.

Monday and Thursday. Fee, *five dollars*.

Second Year.—Bookkeeping. First year's work continued, introducing auxiliary books—cash-book, bill-book, sales and invoice register, etc.

Commercial Arithmetic. Rapid drill; discount and interest, partial payments, equating of accounts.

Tuesday and Friday. Fee, *five dollars*.

Third Year.—Bookkeeping. Advanced work in shipments, consignments, jobbing, joint-stock companies, corporations.

Commercial Arithmetic. Financial problems involving exchanges, stocks, bonds, partnerships, joint-stock company accounts.

During this year a course of twelve lectures in Business Law, Finance, and Commercial and Financial Institutions, will be given by members of the day staff of instruction.

Monday and Thursday. Fee, *six dollars*.

II. COURSE IN ADVANCED ACCOUNTING

In order to meet a growing demand for instruction in advanced lines of accounting, by working bookkeepers generally, and especially by persons who are desirous of fitting themselves for the examinations of the State Board of Examiners of Public Accountants, the Institute offers a course in the Theory and Practice of Accounting, Auditing, and Business Law. It is the aim of the course to prepare men and women to pass the Certified Public Accountant's examinations. Applicants, whether working or not towards these special examinations, must have been practical bookkeepers for at least five years, and must show by examination that they are prepared to enter upon the advanced work of the course. The course is complete in one session of six months.

The lectures on Finance and on Commercial and Financial Institutions, announced for the Third Year of Course I, will form also a part of this training.

The formation of this class will depend upon the number of applications received by the Institute prior to the opening of the session, October 3d, 1904.

Monday, Tuesday, and Thursday. Fee, *fifteen dollars*.

III. OFFICE COURSE IN STENOGRAPHY AND TYPE-WRITING

The work of this course covers three years, divided as follows:

First Year.—Stenography. Theory of Pitman system, accompanied by frequent drills in phonetics.

The student is prepared for slow dictation by the end of the first year.

Typewriting—Word exercises; copying of letters and exercises to illustrate the use of different parts of the machine.

Monday and Thursday. Fee, *five dollars*.

Second Year.—Stenography. Half of the session is spent upon the dictation of carefully graded exercises, with correct shorthand keys constantly before the student, followed by the reading and transcribing of notes. A moderate rate of speed is acquired in this year.

Typewriting—Exercises in copying and spacing and in transcribing from rough draft.

Tuesday and Friday. Fee, *five dollars*.

Third Year.—Stenography. The entire session is devoted to varied dictation, accompanied by nightly transcript of notes upon the typewriter. By the end of this year, the student acquires a note-taking speed of from ninety to a hundred words per minute.

Typewriting. Arrangement of papers—legal papers, specifications. Explanation of duplicating processes, press-copying apparatus, and leading makes of typewriters.

Tuesday and Friday. Fee, *six dollars*.

ADVANCED STANDING.—Applicants who wish to do advanced work in either bookkeeping or stenography are admitted to the second- or third-year class of either course, on evidence, by examination, of ability to pursue the work of the desired grade.

ENGLISH.—The class in English is provided primarily for the purpose of affording instruction to those students in either of the foregoing courses who fail to meet the requirements as set forth under "Certificate" below. No additional fee is charged.

Special students, also, are admitted to this class. The instruction aims to give thorough drill in punctuation, capitalization, sentence structure, paragraphing, ready writing—in short, a practical presentation of the subject, with a view to meeting the needs of the office clerk.

The class attends on Wednesday evening. Fee, for special students, *three dollars*.

TEXT-BOOKS.—Students are required to supply their own text-books.

CERTIFICATE

The Certificate of the Department of Evening Courses is granted to students who complete any one of the three courses announced, and who pass a satisfactory examination in English composition. Students who fail to pass the English examination must attend the class in English for at least one year.

COURSES IN DOMESTIC ARTS AND DOMESTIC SCIENCE

DRESSMAKING

CAROLINE A. M. HALL, Director. MARY L. SARGENT,
MARY E. EASTWOOD, JENNIE COLLINGWOOD, MARY H.
BROWN, LAURA E. WAGNER, Instructors.

FIRST GRADE.—This grade is devoted to the fundamental principles of dressmaking. One plain dress is completed.

The work comprises:

Choice of materials; textiles as to color and application to dress.

Taking measurements; drafting foundation skirt; drafting draperies; finishing skirt for trimming or draping; making lined skirt.

Plans for completing skirts; cutting waists from measurements taken from different members of the class; basting, fitting; planning trimming; general finish.

Monday and Thursday, or Tuesday and Friday.
Fee, *four dollars*.

SECOND GRADE.—In this grade attention is paid to taking measurements of different figures and to drafting patterns from the same.

Three dresses are made of different materials. The course includes:

Color and textiles; their various uses and relations to personal adornment.

Taking measurements; drafting plain waist from different measurements; drafting waist with extra seams for large figure; cutting and matching striped, plaid, or figured material for waist—making and trimming the same; drafting and making dresses on the gown-form, from the student's own design.

Monday and Thursday, or Tuesday and Friday. The fee, including the price of the drafting-chart which is supplied to each student by the Institute, is *eight dollars*.

THIRD GRADE.—The work of this grade is chiefly an extension of that of the two preceding grades, with the additional subjects of instruction named below. For further practice, students may receive and execute orders. The work comprises:

Advanced drafting. Choice of materials for gowns of special character.

Making dresses of different kinds.

Making models of inexpensive materials to test the design.

Child's dress—materials, drafting, cutting, and making the same.

Monday and Thursday, or Tuesday and Friday. Fee, *six dollars*.

Each grade occupies one session. In each grade two lessons, of two hours each, are given weekly.

CERTIFICATE.—The certificate of the Department of Evening Courses is granted to students who complete

the three years' course and pass satisfactory examinations in the work prescribed.

SEWING

COURSE IN HAND AND MACHINE SEWING.—The Course in Sewing includes the simple stitches used in hand and machine sewing and their application in the making of garments. Work cut and planned in the classroom must be completed at home. All materials are supplied by the students.

Students who have not had the necessary preliminary training or experience in hand and machine sewing are expected to take this course, in whole or in part, before beginning the dressmaking work.

The course consists of three grades, each grade occupying one term or session. Two lessons, of two hours each, are given weekly.

Students who can meet the requirements of the preceding grades will be admitted to advanced standing.

Monday and Thursday, or Tuesday and Friday.
Fee, *three dollars* for each session.

SHIRT-WAIST COURSE

This course has been arranged to meet the increasing demand for instruction in the making of shirt-waist suits and gowns of more elaborate designs, in washable materials. It occupies one session. For admission, an examination is required in hand and machine sewing.

Tuesday and Friday. Fee, *four dollars*.

MILLINERY

EMILY G. SWETT, Director. CORA FOX and NELLIE M. LOTZ, Instructors.

FIRST GRADE.—In this grade the work begins with the study of the hat in detail. It includes: General principles of harmony of color; wiring, folds, fitted facing, shirred facing, puffed edge; bows and rosettes; fitted hat made, lined, and trimmed.

All the work is executed in practice materials which are selected and furnished by the student.

The knowledge so gained is applied at the end of the session in making one hat of choice materials.

Monday and Thursday. Fee, *four dollars*.

SECOND GRADE.—In this grade the bonnet and toque are studied, using for practice materials which are appropriate for the same. The work includes: Color and materials as related to the head-dress; bonnet, with plain crown and with puffing, made, lined, and trimmed; bonnet of more complex design; toque made, lined, and trimmed; practical work leading to a knowledge of the designing of bonnets and hats.

Tuesday and Friday. Fee, *six dollars*.

Each grade occupies one session.

CERTIFICATE.—The certificate of the Department of Evening Courses is granted to students who complete the two years' course and pass satisfactory examinations in the work prescribed.

COOKERY

HELEN M. SPRING, Director. KATHARINE MC COL-
LIN, Instructor.

FIRST COURSE.—Instruction in the composition and dietetic value of food materials. The lessons are arranged in logical order, and each principle is illustrated by the preparation of simple dishes. The instruction is largely individual, each student preparing an entire dish. The object of the course is the preparation of food in the most digestible and appetizing forms.

Monday. Fee, *five dollars*.

SECOND COURSE.—Instruction and practice of an advanced character, in the preparation of more complicated dishes than are included in the First Course.

Tuesday. Fee, *six dollars*.

INVALID COOKERY.—The preparation of food suitable for the sick-room. The course is the same as that given to professional nurses.

Fee, *six dollars*.

Each of the above courses occupies one session

SERVING COURSE.—A course of eight lessons, including the following subjects in which every practical housekeeper should be expert: Care of dining-room and pantry; care of silver and cutlery; serving of

breakfast, luncheon, and dinner; washing dishes; washing and ironing table-linen; removal of stains.

Thursday. Fee, *three dollars*.

A class for men in the *Use of the Chafing-dish* will be formed, if a sufficient number of persons apply.

All the materials used in the instruction are supplied by the Institute.

COURSES IN ENGLISH LANGUAGE AND LITERATURE

PROFESSOR H. L. MASON in charge. ALICE M. BRENNAN, LILLIAN M. DALTON, RUTH COLLINS, Instructors.

FIRST COURSE

LANGUAGE.—Review of essentials of English Grammar. Analysis and synthesis of sentences. Common errors. Punctuation. Figures of speech. Social and business forms of letter-writing.

LITERATURE.—Selected readings in American classics: Bryant, Poe, Longfellow, Holmes, Lowell, Whittier.

Tuesday and Friday, at 7.30.

Fee for the session, *four dollars*.

SECOND COURSE

LANGUAGE.—Elements of rhetoric. Words: synonyms, barbarisms, improprieties, solecisms. Sentence-writing: unity, concord, emphasis, correlation; periodic, loose, balanced, long, short. Elements of style: force, rapidity, life, smoothness. Paragraph writing: unity, coherence, development.

LITERATURE.—Historical sketch of American literature. Readings from Irving, Emerson, Cooper, Hawthorne, Thoreau.

Monday and Thursday, at 7.30.

Fee for the session, *four dollars*.

THIRD COURSE

LANGUAGE.—Rhetorical analysis: studies in style and invention, based on the critical study of selections from typical English and American writers. The studies illustrate also the processes of description, narration, exposition, argumentation, persuasion. Composition and criticism—special attention is given to both class and individual criticism of the student's original work.

LITERATURE.—Historical sketch of English literature. Critical reading of selected plays of Shakespeare.

Monday and Thursday, at 7.30.

Fee for the session, *five dollars*.

The work of the three courses is progressive, and pupils are advanced from the lower to the higher course *on examinations* at the close of each session, or during the session if their progress warrants it. Upon satisfactorily passing all the examinations prescribed for the Third Course, students receive the Certificate of the Institute.

PHYSICAL TRAINING

CLASS FOR YOUNG WOMEN.—Wednesday and Friday.
MAUDE G. HOPKINS, Director.—Fee, *five dollars*.

CLASS FOR YOUNG MEN.—Monday and Thursday.
J. PETERSON RYDER, S. B., Director.—Fee, *five dollars*.

FREE CLASSES IN CHORAL MUSIC

CHARLES M. SCHMITZ, Director. JAMES M. DICKINSON, Accompanist.

The instruction in choral music is organized, as follows: I. The Drexel Chorus; II. The Choral Class.

I. THE DREXEL CHORUS.—The Drexel Chorus is composed of men and women desirous of devoting themselves to the study and rendition of choral works by the great masters. The Chorus meets in the Auditorium where the grand organ is available in connection with the training.

The meetings of the Chorus extend over a session of six months, beginning in October and closing the end of March. The Chorus meets weekly on Monday, at 8 p. m. The first meeting will be on Monday, October 3d.

Two public concerts are given, one about Christmas and the other at the close of the session.

Former members of the Drexel Chorus and members of the previous year's Choral Class are entitled to admission, without further examination, upon presentation of the former year's class ticket to the Registrar of the Institute.

New members must be able to read music fairly.

II. THE CHORAL CLASS.—The Choral Class, which is formed yearly, is for young men and young women who are desirous of studying choral music under such conditions as will lead to their admission to the Drexel

Chorus. An acquaintance with musical notation is desirable, but a willingness to devote the necessary time to vocal training in choral singing is the chief qualification for admission. A new class is formed each year.

The class meets weekly in the Auditorium, on Wednesday, at 8 p. m., from October to March, inclusive. The first meeting will be on Wednesday, October 5th.

A public concert is given at the end of the session.

There is no charge for the instruction and training in the Drexel Chorus or the Choral Class, but there is a fee of *one dollar* for registration.

New candidates for admission to the Drexel Chorus or to the Choral Class, must apply in person to Mr. Schmitz, the Director, for classification, at the Institute, as follows:

Thursday, September 22—7.30 to 9.30 p. m.

Friday, September 23—7.30 to 9.30 p. m.

Saturday, September 24—7.30 to 9.30 p. m.

Monday, September 26—7.30 to 9.30 p. m.

Tuesday, September 27—7.30 to 9.30 p. m.

Saturday, October 1—7.30 to 9.30 p. m.

Monday, October 3—First rehearsal of the Drexel Chorus, at 8 p. m.

Tuesday, October 4—7.30 to 9.30 p. m.

Wednesday, October 5—First rehearsal of the Choral Class, at 8 p. m.

Thursday, October 6—7.30 to 9.30 p. m.

Friday, October 7—7.30 to 9.30 p. m.

Saturday, October 8—7.30 to 9.30 p. m.

**DEPARTMENTS OF FREE PUBLIC LECTURES
AND CONCERTS, LIBRARY, MUSEUM,
PICTURE GALLERY**

DEPARTMENT OF FREE PUBLIC LECTURES AND CONCERTS

The work of the department includes the Free Courses of Public Lectures and Concerts which are given during the winter months, beginning in November and continuing until the end of March. During the greater part of the season, a concert is given every Thursday evening. An idea of the place these lectures and concerts hold in the work of the Institute may be formed from the fact that the attendance during the season of 1903-04 was about thirty thousand.

The following are the programs of the Lectures and Concerts for the past season:

LECTURES

A course of seven lectures on "Japan and Japanese Art," by Professor Ernest F. Fenollosa.

Lecture on "Mural Painting," by Mr. Will H. Low, New York.

Lecture, "The Tower of Pelée: New Researches in the Island of Martinique," by Professor Angelo Heilprin.

Lecture, "Under a White Umbrella," by Mr. F. Hopkinson Smith, New York.

Lecture-Recital, "The Music of the North American Indian," by Mr. Harvey Worthington Loomis, New York.

A course of nine lectures on "The History of Painting," by Mr. James L. Wood, Drexel Institute.

A course of ten lectures on "The Human Body—its Structure, Functions, and Hygiene," by Professor Albert P. Brubaker, M. D., Drexel Institute.

Lecture-Recital, "Pulse and Rhythm in Verse and Music," by Miss Mary Hallock, Philadelphia.

Lecture, "Canada—Historical and Picturesque," by Mr. Charles F. Warren, United States Department of Labor, Washington, D. C.

Lecture, "The Passion Play of Oberammergau," by Professor Benjamin F. Battin, Swarthmore College, Pennsylvania.

Two lectures, "The Intellectual Awakening of Europe in the Nineteenth Century," and "Shakespeare's Richard the Second—A Study in the Philosophy of Education," by Miss Caroline M. C. Hart, Philadelphia.

Two lectures, "The Empire of Colorado—Its Pre-Columbian Past and Romantic Development," and "The People of the Pueblos," by Mr. and Mrs. Gilbert Mc Clurg, Colorado Springs, Colorado.

CONCERTS

1. Mr. Frederick Maxson, Organ. Mr. Martinus Van Gelder, Violinist. Mr. Thomas a'Becket, at the Piano.

2. Mr. Minton Pyne, Organ. Mr. Harry B. Gurney, Tenor.

3. Mr. George Alexander A. West, Organ. Miss Julia C. Plantholz, Contralto.

4. Mr. Wassili Leps, Organ. Madame Emma Suelke, Soprano.

5. Mr. Ralph Kinder, Organ. Mr. Frank M. Conly, Bass.

6. Mr. James M. Dickinson, Organ. Agnes Thomson, Soprano. Mr. George Russell Strauss, Baritone.

7. Dr. Hans Harthan, Pianist. Mr. Enrique Bruning, Violinist.

8. Mr. Shepard K. Kollock, Organ. Miss Kathryn McGuckin, Contralto.

9. Mr. Henry Gordon Thunder, Organ. Mr. Henri Guest Scott, Bass.

10. Mr. Ellis Clark Hammann, Organ. Mr. Frederick E. Hahn, Violinist.

11. KALTENBORN STRING QUARTET, New York; Mr. Franz Kaltenborn, First Violin; Mr. John Spargur, Second Violin; Mr. Gustave Bach, Viola; Mr. Louis Heine, Violoncello.

12. Mr. James M. Dickinson, Organ. Instrumental Septet, under the direction of Mr. Charles M. Schmitz.

13. Mr. S. Tudor Strang, Organ. Mr. Owen S. Fitzgerald, Tenor.

14. Mr. William C. Hammond, Organ.

The two following concerts were given by the Drexel Chorus:

15. CHRISTMAS CONCERT. Sacred Cantata, "Israel in the Wilderness"; music by Alfred R. Gaul, verse by Jetty Vogel; under the direction of Mr. Charles M. Schmitz. Soloists, Mrs. Zaidee Townsend Stewart, Soprano; Mr. Owen S. Fitzgerald, Tenor; Mr. G. Russell Strauss, Baritone. Mr. James M. Dickinson, Organist; Mr. Louis Volmer, Pianist.

16. EASTER CONCERT, Oratorio of "The Creation" by Haydn, under the direction of Mr. Charles M. Schmitz. Soloists: Madame Emma Suelke, Soprano; Mr. Harry B. Gurney, Tenor; Mr. Henri G. Scott, Bass. Mr. James M. Dickinson, Organist; Mr. Louis Volmer, Pianist.

17. CONCERT BY THE CHORAL CLASS, under the direction of Mr. Charles M. Schmitz. Miss Harriette R. Woods, Soprano. Mr. James M. Dickinson, Organist.

The last concert makes the one hundred and ninety-ninth in number since the Free Public Concerts were begun.

LIBRARY DEPARTMENT

LIBRARY AND READING-ROOM

STAFF

ALICE B. KROEGER,
Librarian, and Director of the Library School.
ELLA R. SELIGSBERG, B. A., B. L. S.,
Assistant Librarian, and Instructor in the Library School.
FANNIE S. MATHER,
Assistant Librarian, and Instructor in the Library School.
CHARLOTTE KENNEDY HANNUM,
Assistant in Charge of the Circulating Department.
LUCY MACKY,
Library Attendant.
EMMA L. HELLINGS,
Evening Assistant.

The chief purpose of the Library is to supplement the work of the several departments of the Institute. Science, the useful arts, and the fine arts are most largely represented. There is, however, a good collection in general literature. In addition to its use by students and instructors, the Library is free to all residents of Philadelphia for reference and for the home use of books.

The Library has now thirty-one thousand volumes and thirty-five hundred pamphlets. The Reading-room is supplied with one hundred and eighty periodicals. The books are classified by the decimal classification and are arranged in the alcoves, to which the readers have free access. The dictionary card catalogue, for public use, is made as complete as possible by means of references and analyticals. The shelf-list is on cards, forming a classed catalogue for official use.

The Library and the Reading-room are open every day, except on Sundays and legal holidays, from 9 a. m. to 6 p. m., and during the session of the Evening Classes, from 9 a. m. to 10 p. m.

RELATION OF THE LIBRARY TO THE DEPARTMENTS

All books and periodicals are under the management of the Library Department, but every privilege is granted to professors and students in their use of the books. The departments of the Institute have no special libraries. Each instructor can draw from the Library an unlimited number of books which are used in the departments as daily tools. In addition to these books, the professors are given space and tables in the alcoves for "reserved" books, which include such books as the students are required to use constantly. These cannot be circulated outside the Library except over night. In such courses as decoration and architecture, a large number of the fine art books are taken to those department rooms by the directors, and kept during a

term. Constant use is made of these privileges, and the Library is thus brought into close relation with the several departments.

REFERENCE DEPARTMENT AND READING-ROOM

The Reference Department, containing the books which are strictly reference in character, such as encyclopedias, dictionaries, etc., includes one thousand volumes, and is placed in the most accessible part of the Library, where the books can be freely used.

The Reading-room has on file one hundred and eighty periodicals, and a few daily newspapers. The bound volumes of general periodicals, and indexes thereto, are kept in a special alcove at the rear of the Library.

ART ROOM

A portion of the Library has been set apart for books on the fine arts, forming a special alcove containing two thousand volumes. The collection embraces many handsomely illustrated volumes. It is especially strong in the decorative arts.

COLLECTION OF PHOTOGRAPHS AND PRINTS.—The Library has a collection of about two thousand mounted photographs, largely of architectural and decorative subjects. These are classified and catalogued. In addition to this collection of photographs, the Library has received, as a gift from Mr. George C. Thomas, a series of valuable etchings of Ancient Paris and a series of photographs of Old London. One of the most interesting and artistic possessions of the

Library is a collection of Japanese prints, in color, by famous Japanese artists. This is a gift of Mr. James W. Paul, Jr., President of the Board of Trustees. Additions are constantly being made to the collection.

COLLECTION OF LANTERN SLIDES.—This collection is for the use of the instructors, and numbers sixteen hundred slides. The subjects are chiefly architecture, painting, commerce, and history of printing. The slides are classified and catalogued.

SPECIAL COLLECTIONS

1. **THE ANTHONY J. DREXEL BEQUEST** consists of the private library of the founder of the Institute, bequeathed by him to the Library (1893). It comprises editions of the standard English and American authors.

2. **THE GEORGE W. CHILDS COLLECTION OF MANUSCRIPTS AND AUTOGRAPHS**, collected by the late Mr. George W. Childs during his lifetime, and presented by him to the Library in December, 1891, consists of valuable original manuscripts of modern authors and autograph letters of noted persons. Among the treasures of the collection are: The original manuscript of Dickens's "Our Mutual Friend," bound in two volumes, closely written, as it was sent to the printer, with innumerable erasures and insertions; an autograph manuscript of Thackeray's "Lecture on George III," handsomely bound and extra-illustrated with portraits and original drawings and water-colors by Thackeray (this is the copy from which he read

when he lectured in America); the original manuscript of Poe's "The Murders in the Rue Morgue"; of Lamb's "Essay on Witches and other Night Fears," signed Elia; of Bremer's "Hertha"; of Godwin's "Cloudesley, a Novel"; of André's "The Cow Chace," and of many other important works. The autograph letters comprise, among others, a set of letters from the Presidents of the United States; the Pinkerton correspondence (in four volumes), including letters from many noted Englishmen of the latter part of the eighteenth century, to John Pinkerton; and collections of miscellaneous letters, written by English and American authors and statesmen.

3. THE CHARLES H. JARVIS MEMORIAL LIBRARY OF MUSIC, presented in 1896 by the daughters of the late Mr. Jarvis, an eminent Philadelphia musician. It comprises a collection of twelve hundred and thirty-six bound volumes of music, including the piano and orchestral works of many of the classical composers. This Music Library is handsomely housed in a room at the rear of the Library, with a special author and classed card catalogue, bringing out, so far as possible, the contents of each volume under authors and subjects. The collection of music belonging to the sister of Mr. Jarvis, the late Mrs. Helen Jarvis Davis, is contained also in the Music Library. It was presented by her son, Mr. Charles H. Davis. This Library is for reference only.

4. THE GEORGE M. STANDISH COLLECTION was presented to the Library in 1898, by an American gentle-

man, for many years a resident of Italy. The collection comprises his personal library gathered during this time, and is made up of examples of early printed books; rare works on art, architecture, and antiquities; fine editions of the Italian classics; a large number of English books on art, literature, and history; dictionaries, prints, photographs, and drawings. A special alcove, suitably inscribed, is set apart for the collection, to which access is given on application to the Librarian.

EXHIBIT ALCOVE

Frequent exhibits of photographs, prints, and plates from illustrated books are held in the Exhibit Alcove.

PUBLICATIONS

A series of Reference Lists is issued occasionally; three numbers have appeared: No. 1, Costume; No. 2, Music; No. 3, Decoration and Design. These are sold at a nominal price.

DONORS

Among those who have given largely to the Library, besides the founder, are: Mr. James W. Paul, Jr., Mr. George W. Childs Drexel, Mr. John R. Drexel, Mrs. George W. Childs, Mr. George C. Thomas, Mr. Joseph G. Rosengarten, Mr. Clarence S. Bement, Mr. George M. Standish, Mrs. Edwin W. Lehman, the late Mr. George W. Childs, and the late Mrs. J. Dundas Lippincott.

MUSEUM

MARY T. MAC ALISTER, Curator

The formation of a museum of fine and industrial art was part of the original scheme for the Institute, as approved by its founder. The object was to place within the walls of the Institute such art collections as would be of value in connection with the various lines of instruction, and as would also serve as a museum for the general public. The founder's deep interest in this project was shown by the gifts he made to the Museum during his lifetime, and by the bequest of his pictures and other art objects belonging to him at the time of his death. The intentions of the founder have been generously seconded by members of his family and other persons. With the exception of a few purchases made at the close of the Columbian Exposition at Chicago, in 1893, the Museum, as it now stands, has been built up almost wholly by gift. The beginning of the collections was made by President Mac Alister in London, in 1891, with the kind cooperation of the late Sir Philip Cunliffe Owen, Director of the South Kensington Museums, and Mr. Purdon Clarke, at that time Keeper of the India Museum. These original purchases, consisting of textiles, furniture, ceramics (chiefly oriental), wood-carvings, metal-work, and

oriental embroideries, are of great interest and permanent value.

The installation of the Museum is unsurpassed by that of any museum in the United States. The cases have been made from designs furnished by the late Sir Philip Cunliffe Owen, and are of the finest quality and well adapted to the display of the collections which they contain.

The growth of the Museum has been so rapid that it has not been deemed advisable thus far to print a general catalogue of the collections; but the labels briefly describing all important objects are a useful aid to visitors.

The chief collections in the Museum are, as follows:

1. The collection of European Textiles, dating from the fourteenth to the eighteenth century, inclusive, presented by the founder of the Institute.
2. The collection of India Printed Fabrics, presented by the founder of the Institute.
3. Collections of European Bronzes, Ceramics, etc., presented or bequeathed by the founder of the Institute.
4. The Memorial Collection to Mrs. Anthony J. Drexel, made by her daughter, the late Mrs. James W. Paul, Jr., consisting of ceramics, metal-work, wood-carvings, and Italian ecclesiastical embroideries of the sixteenth and seventeenth centuries.
5. The Memorial Collection to Mrs. James W. Paul, Jr., presented by her husband, consisting of laces, a

magnificent pair of Meissen candelabra (formerly belonging to the late King Ludwig II of Bavaria), a fine seventeenth century Flemish tapestry, the Doulton Mermaid Vase, a collection of Phœnician glassware, etc.

6. A collection of Royal and Imperial Sèvres Ware, presented by Mr. John H. Harjes, of Paris.

7. A collection of Egyptian Antiquities, presented by Colonel Anthony J. Drexel, representative of the arts and life of the ancient Egyptians. This collection was made for the Institute by Emil Brugsch Bey, Keeper of the Egyptian Museums at Boolak.

8. A collection of Ivories (European and Oriental), presented by the late Mr. George W. Childs.

9. A collection of Engravings and Etchings, embracing examples of work chiefly by the French, English, and German masters, presented by the late Mr. George W. Childs

10. A collection of Japanese Ceramics, presented by Dr. Edward H. Williams.

11. A collection of Laces, Oriental Embroideries, Artistic Jewelry, Ceramics, and other articles of artistic or historic interest, presented by Mrs. George W. Childs.

12. A small collection of Tanagra Figurines, presented by Colonel Anthony J. Drexel.

13. A Memorial Collection of Ceramics, Metal-work, and Embroideries to the late Lieutenant Allan G. Paul, U. S. N., presented by his family.

14. A collection of Ivories and Ceramics, presented by Mrs. Joseph W. Drexel.

15. A collection of Persian, Moorish, and Arab Arms, presented by Colonel Anthony J. Drexel.

16. A collection embracing some fine examples of Japanese Lacquer and Bronze Work, a bronze statuette of Jizo, an ancient German Clock, small jeweled and enameled French clocks, presented by Mrs. Alexander Van Rensselaer.

17. A collection of colored plaster reproductions of the interior of the Alhambra, a piece of early French Gothic sculpture, and two paintings, presented by the late Mr. John A. Johann.

18. A collection of arms, ancient furniture, textiles, wood-carvings, and ceramics, presented by Mr. George M. Standish.

19. A collection of Egyptian Prehistoric Flint Implements, from the "Finds" of Mr. H. W. Seton-Karr, presented by him through Mr. H. L. Clapp.

20. A collection of objects illustrating Russian peasant life, and a collection of shoes from different countries, presented by Mrs. Francis I. Maule.

21. Marble statue, "Georgian, Surprised at the Bath," by Scipio Tadolini, presented by Mr. Seth B. Stitt.

22. There is a good collection of plaster casts, representative of the sculpture of the Classic and Renaissance periods, which is placed in the art studios.

There are other art collections, such as the collection of Japanese Prints, which are kept in the Library of the Institute.

23. Gifts to the Museum have been made also by Mr. John R. Drexel, Mr. George W. C. Drexel, Mr. Joseph G. Rosengarten, Messrs. Bailey, Banks & Biddle, Mrs. Thomas K. Conrad, Mrs. Catherine A. Howell Flourney, Mr. William Struthers, Mrs. C. P. Sinnickson, Mrs. W. W. Hale, the late Mr. George F. Tyler, the late Mrs. Sarah Howard Peterson, the Estate of William H. Rawle, and the late Mr. Howard Potter of New York.

THE BASILICA OF ST. MARK.—One of the most striking objects in the Museum is the View of the Façade of the Church of St. Mark, Venice, published by Ongania, which has been mounted and framed and set up for permanent exhibition. The picture is eight feet wide and six feet high (without the frame), and is placed in the Lobby opening from the Great Court. It is in the finest quality of chromo-lithography, after the marbles, mosaics, and bronzes which make up the architecture, sculpture, and decoration of the façade, and gives a vivid impression of the splendid mass of design and color which has been so eloquently described by Ruskin in his "Stones of Venice." The details are large enough to admit of exact study.

The magnificent work, of which this picture forms a part, with plates of the innumerable details of the exterior and interior of the Church, in photogravure and chromo-lithography, is in the Library of the Institute, and may be consulted on application to the

Librarian. The entire work, comprising sixteen large folios and five volumes of text, and which required ten years for its publication, was presented to the Institute by Mr. James W. Paul, Jr.

The Museum is open free to the public, daily, except on Sundays and legal holidays, from 9 a. m. to 6 p. m., and during six months of the year, from October to March, inclusive, until 10 p. m.

PICTURE GALLERY

By the death, in 1901, of Mr. John D. Lankenau, the Institute came into possession, by bequest, of his important and valuable collection of paintings, which is known as THE JOHN D. LANKENAU COLLECTION. A fine gallery for these paintings has been provided in East Hall, and was formally opened to the public on December 19th, 1903. The collection is especially notable because of the large number of examples of the work of modern German artists, among which are paintings by Andreas Achenbach, Oswald Achenbach, Brandt, Dücker, Gebler, Grützner, Heilbuth, Knaus, Koekkoek, Lauenstein, Lessing, Preyer, Salentin, and Schreyer. It contains also fine works by Corot, Daubigny, Diaz, Dupré, Jimenez, and Ziem.

THE ANTHONY J. DREXEL COLLECTION, comprising the paintings bequeathed by the founder of the Institute, are exhibited also in the Gallery. Among these are examples of the works of Meissonier, Bouguereau, Jules Stewart, Coignard, Dupray, Cesar de Cock, Boldini, Rico, Michetti, Madrazo, Jimenez, Ecüsquisa, Van Marcke, Gieryinski, Ridgway Knight, Richards, and others.

The Picture Gallery is open free to the public daily, except on Sundays and legal holidays, from 9 a. m. until 4 p. m., and on stated evenings during the winter months.

INDEX

Admission to Departments and Courses.	PAGE
Architecture	54
Chemistry	130
Commerce and Finance	150
Commercial Course for Teachers	140
Cookery	165
Design and Decoration	47
Domestic Arts, Normal Course in	194
Domestic Science, Normal Course in	165
Domestic Science and Arts, Junior and Advanced Elec- tive Courses	208
Drawing, Painting, and Modeling	34, 41
Dressmaking	183
Engineering, Electrical, School of	57
English Language and Literature	218
Evening Courses	225-268
Illustration	31, 41
Library School	214
Machine Construction	108
Mathematics	114
Mechanic Arts	97
Mechanical Drawing	102
Millinery	189
Nurses Training Schools, Preparatory Course for	172
Physical Training	222
Physics	116, 117, 119, 121
Wood-Carving	36
Advisory Board of Women	14
Architecture, School of	48
Course of Instruction	49
Faculty and Instructors	48
Graduate Course	53
Art, Fine and Applied, Department of	29
Faculty and Instructors	29

Art, Fine and Applied, Department of—Continued.	PAGE
Prizes	38
Scholarships	31, 37
Board of Trustees	13
Calendar	vi
Chemistry, Courses in	123
Courses of Instruction	123
Instructors	123
Choral Music, Free Classes in	267
Clay Modeling, Course in	35
Commerce and Finance, Department of	132
Commercial Course for Teachers	140
Commercial Museum	149
Courses of Instruction	134
Distribution of Time	139, 143, 145, 147, 148
Faculty and Instructors	132
Office Courses	144
School of Commerce and Accounts	134
Departmental Statements. <i>See</i> Departments of Instruction.	
Departments and Courses of Instruction	21, 23
Design and Decoration, School of	42
Course of Instruction	43
Graduate Courses	44
Instructors	42
Diplomas and Certificates. <i>See</i> Departments of Instruction.	
Domestic Arts, Department of	177
Dressmaking, Courses in	177
Normal Course	190
Millinery, Courses in	185
Sewing, Course in	182
Domestic Science, Department of	152
Courses in Household Economics	153
Faculty and Instructors	152
Normal Course in Domestic Science	156
Domestic Science and Arts, Department of Junior	199
Courses of Instruction	200
Faculty and Instructors	199
Subjects of Instruction	204
Drawing, Painting, and Modeling, School of	32
Classes in	32
Dressmaking, Courses in	177

INDEX

287

Dressmaking, Courses in—Continued.	PAGE
Courses of Instruction	177
Instructors	177
Drexel Institute	1
Annex, The	6
Auditorium, The	7
Buildings, Description of	3
Court, The Great	7
Dedication	1
Departments, List of	11
East Hall	5
Endowment	2
Founder	1
Gymnasium	10
Heating, Lighting, and Ventilation	10
Laboratories, Studios, and Classrooms	5, 6
Lecture-Room, The	8
Lectures and Concerts, Free Public	3
Library and Reading-Room	9
Lobby, The	9
Main Building	4
Museum, The	10
Picture Gallery, The	9
Students Restaurant	6
Elective Courses. <i>See</i> Departments of Instruction.	
Engineering, School of Electrical	56
Classrooms and Laboratories	64
Course of Instruction	60
Distribution of Time	61
Faculty and Instructors	59
Institute Shops	73
Subjects of Instruction	75
English Language and Literature, Courses in	216
Instructors	216
Equipment. <i>See</i> Departments of Instruction.	
Evening Courses, Department of	225
Fees and Terms.	
Architecture	54
Chemistry	130
Clay Modeling	40
Commerce and Finance	150

Fees and Terms.—Continued.		PAGE
Commercial Course for Teachers		150
Cookery		166
Design and Decoration		47
Domestic Arts, Normal Course in		195
Domestic Science, Normal Course in		160
Domestic Science and Arts, Junior and Advanced Elec- tive Courses in		208
Drawing, Painting, and Modeling		39
Dressmaking		183
Engineering, Electrical, School of		63
English Language and Literature		218
Evening Courses	225-268	
Illustration		39
Library School		215
Machine Construction		109
Mathematics		114
Mechanic Arts		98
Mechanical Drawing		102
Millinery		189
Nurses Training Schools, Preparatory Course for		173
Physical Training	221, 222	
Physics		121
Wood-Carving		40
Illustration, School of		30
Classes in		30
Scholarships, Free		31
Introduction		I
Laboratories and Workshops. <i>See</i> Departments of Instruction.		
Laboratory Work. <i>See</i> Departments of Instruction.		
Lectures and Concerts, Department of Free Public		269
Library Department		272
Art Room		274
Collections, Special		275
Staff		272
Library School		209
Course of Instruction		210
Faculty and Instructors		209
Machine Construction, Course in		104
Course of Instruction		105
Faculty and Instructors		104

INDEX

289

	PAGE
Mathematics, Courses in	110
Courses of Instruction	110
Instructors	110
Mechanic Arts, School of	89
Course of Instruction	91
Distribution of Time	94
Faculty and Instructors	89
Mechanical Drawing, Course in	99
Course of Instruction	100
Faculty and Instructors	99
Millinery, Courses in	185
Courses of Instruction	185
Instructors	185
Museum Department	277
Normal Courses for the Training of Special Teachers.	
Commercial Course for Teachers	140
Domestic Arts	190
Domestic Science	156
Nurses Training Schools, Preparatory Course for	169
Course of Instruction	171
Instructors	170
Subjects of Instruction	173
Officers of Instruction and Administration	15
Offices	21
Physical Training, Department of	220
Directors	220
Lectures on Anatomy and Physiology	223
Physics, Courses in	115
Courses of Instruction	115
Instructors	115
Picture Gallery	284
Science and Technology, Department of	56
Special Courses. <i>See</i> Departments of Instruction.	
Subjects of Instruction. <i>See</i> Departments of Instruction.	
Wood-Carving, Course in	35

x



This book is under no circumstances to be
taken from the Building

[illegible]

